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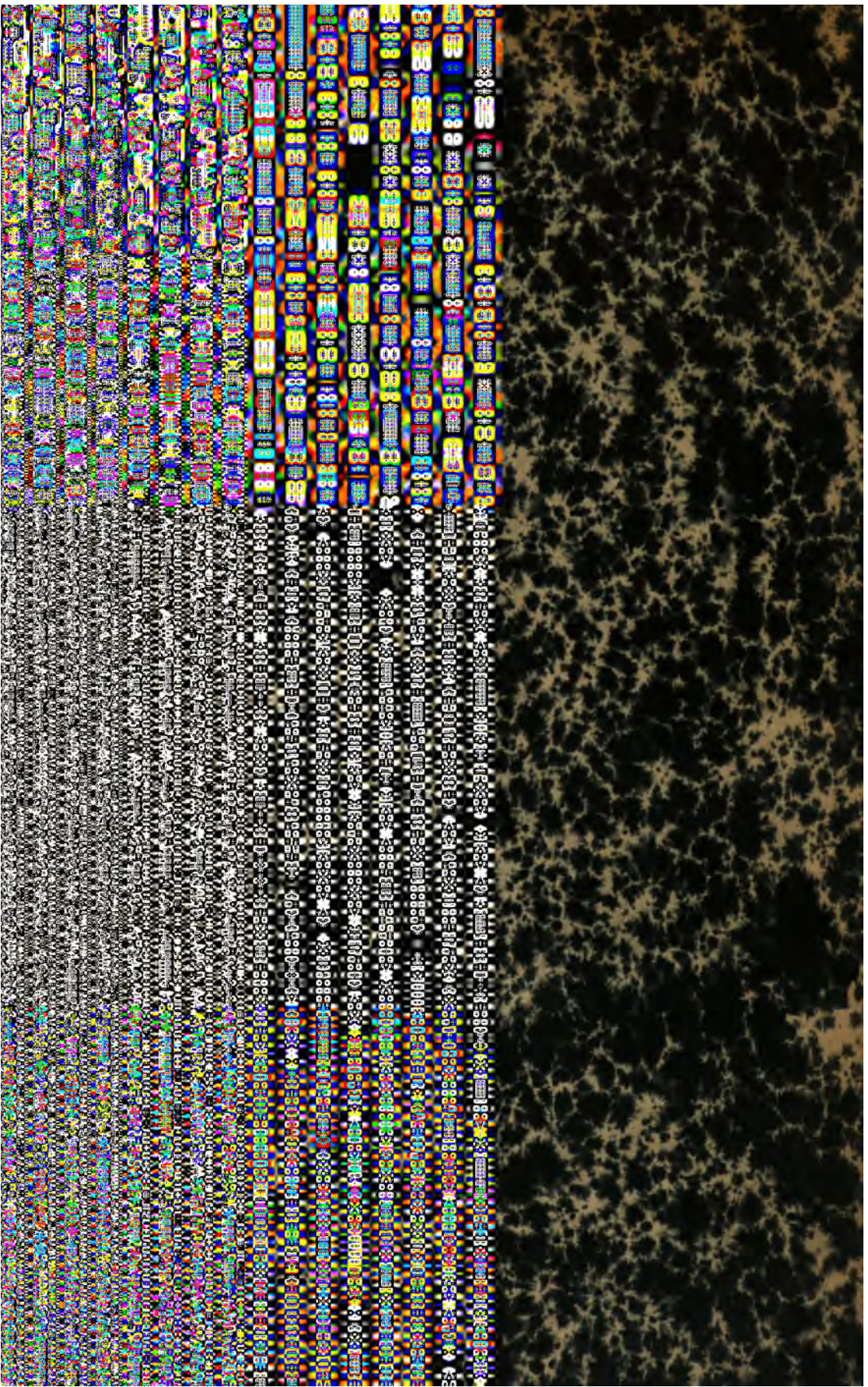
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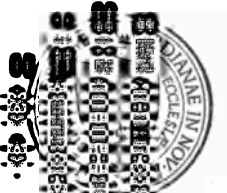
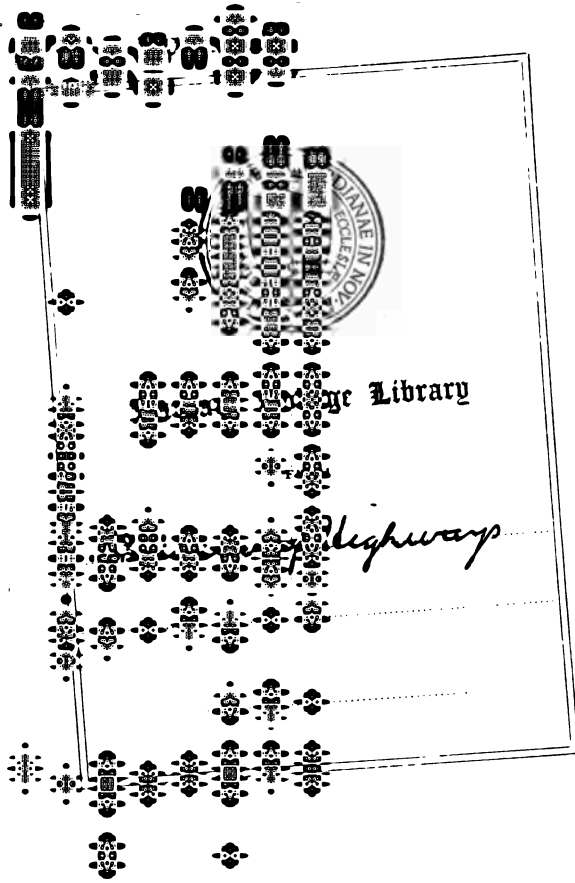
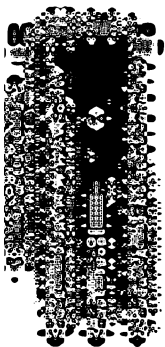
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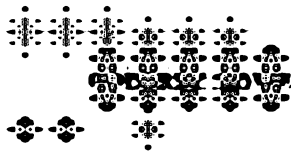
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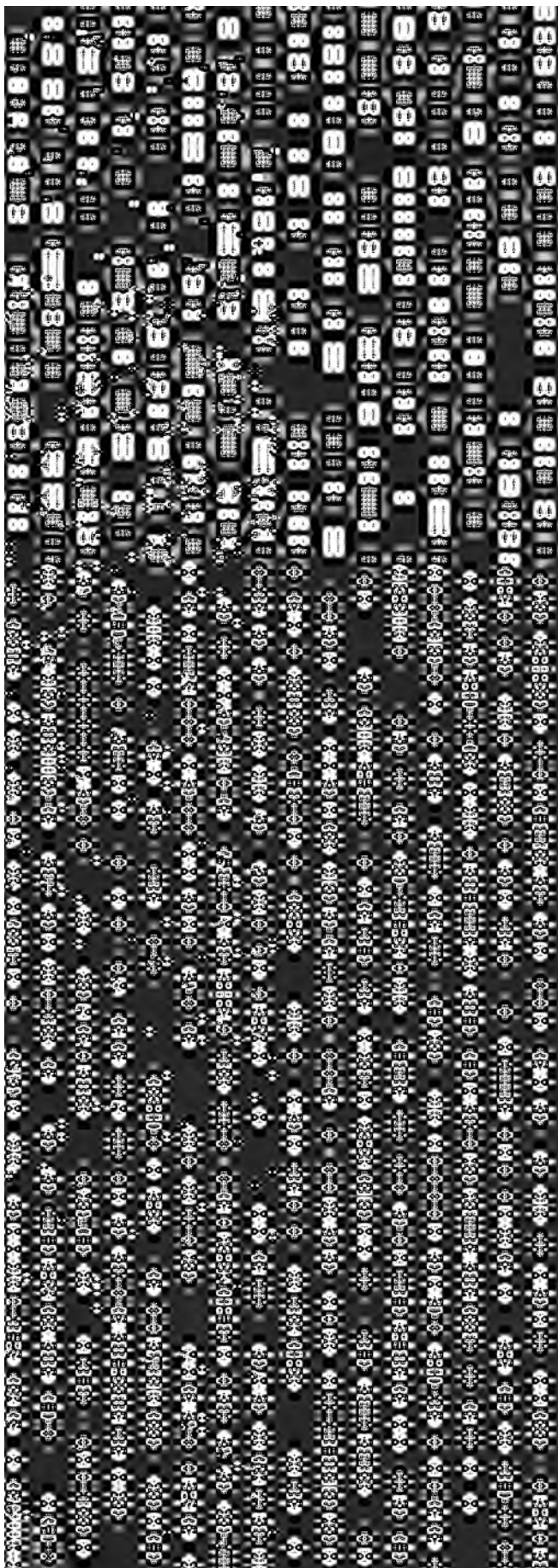
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DEPARTMENT OF PUBLIC WORKS
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REPORT ON SERVICE TEST ROAD

Byberry and Bensalem
Turnpike

NOVEMBER, 1918



Library of Congress

DEPARTMENT OF PUBLIC WORKS
BUREAU OF HIGHWAYS AND STREET CLEANING
ROOM 232, CITY HALL
PHILADELPHIA

November 11th, 1913.

Hon. Morris Llewellyn Cooke,
Director, Department of Public Works,
Philadelphia, Pa.

Dear Sir:—

In a conference with you in the early part of my administration you suggested the desirability of building a Service Test Roadway in the City of Philadelphia, constructed of a number of different kinds of materials and methods of construction, for the purpose of accumulating data to be used as a future guide in connection with country road construction in the City of Philadelphia and in and about this section of the country.

The roadway selected for this purpose was the Byberry and Bensalem Turnpike, and runs from Bustleton Pike to the dividing line between the City of Philadelphia and Bucks County. This roadway is the logical main through route from Philadelphia to Trenton, Newark, Jersey City and New York, and at the present time is used principally for through automobile traffic. It is an old road and was in use prior to the Revolution and was originally known as the King's Highway. It was legally opened December 5th, 1807. A turnpike company was organized and chartered in 1848, and opened it as a turnpike in 1852, the total length being $5\frac{1}{4}$ miles, of which 3 4-10 miles is within the limits of the City of Philadelphia, and comprises the Service Test Roadway.

The construction work was commenced on September 28th, 1912, and was suspended during the winter season, when the weather was too cold for work of this char-

acter. Operations were resumed again on April 14th, 1913, and the roadway was completed September 13th, 1913. On account of lack of transportation facilities and the consequent scarcity of labor, the work was carried on with difficulty. With few exceptions, all of the labor employed came from the built-up portion of the city and the transportation was paid by the contractors. The expense of this transportation was approximately 7% of the entire labor cost. This section of the city is so far removed from transportation facilities that the contractors constructed a building along the line of the work for the men to live in. Most of them, however, insisted upon going to their homes in the city, and although the labor was paid generally for a working day of ten hours, the work could not be prosecuted for ten hours every day on account of the necessity of allowing the men time to make connections with the trains.

The materials used in the construction were shipped to Bustleton, Byberry, Somerton and Trevoise stations on the Philadelphia & Reading Railroad. The average length of haul from the railroad to the work was $1\frac{1}{2}$ miles, and this long haul increased the cost of the work.

I mention these facts because the costs are somewhat higher than they would be under more satisfactory conditions.

The roadway is now completed and comprises twenty-six (26) sections consisting of different methods of construction and classes of road materials.

In the past few years a number of experimental roadways have been constructed—one of which was built under my supervision, and is known as the White Plains Road Experimental Pavements, in the Borough of the Bronx, New York City.

A large part of the data which governed the selection of the different methods of construction and materials used in the Service Test Roadway, was the result of the

experience gained through, and the data collected from, the experimental roadways throughout the country. Therefore, this is in no sense an experimental roadway, but is distinctly a service test roadway, embracing practically all of the present day standard methods of construction and materials used in roads designed to care for both automobile and horse-drawn traffic.

It is the intention to publish reports from time to time embracing a traffic census, and other engineering records, and data resulting from scientific researches, which will enable engineers and all others interested in the good-roads movement to benefit by the experience of the City of Philadelphia with this Service Test Roadway.

Respectfully,

WILLIAM H. CONNELL,

Chief, Bureau of Highways and Street Cleaning.

Service Test Road

Byberry & Bensalem Turnpike.

Section One

Station 0 + 00 to 37 + 00

Bituminous Pavement Mixing Method

Amiesite.

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base.

After cleaning and spiking the old macadam, 1½ inch trap rock was spread and rolled to bring the surface to a grade two inches below the finished grade. Just enough screenings were added to form a coarse grainy base and the road was rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Surface Course:

The paving mixture was shipped from the plant of the Amiesite Company, and consisted of clean crushed trap rock passing a 1½ inch screen treated with a liquifier, and mixed with asphaltic cement, after which oxide of lime was added. The paving mixture consisted of the following proportions:—

Mineral aggregate..	92	per cent.
Asphalt	5	“ “
Lime	1½	“ “
Liquifier	1½	“ “

The material was spread and rolled to a depth of two inches and after rolling once over, a final course of friable filler, consisting of a mineral aggregate of trap rock passing a ¾-inch ring and treated and mixed in the same proportion as above described, was then spread and rolled with a twelve-ton roller.

Surface Finish:

Upon the wearing surface a thin layer of clean trap rock screenings was spread and rolled.

Cost Per Square Yard

Preparation of Foundation Course	\$0.1210
Surface Course	0.6226
Surface Finish	0.0075
Trimming Shoulders	0.0062
	<hr/>
	\$0.7573

Detailed Cost Per Square Yard**Preparation of Foundation Course**

Materials:		Per Sq. Yd.
1½-inch Trap Rock, 71 cu. yds., @		
\$1.755	\$124.61	\$0.0184
Trap Rock Screenings, 50 cu. yds.,		
@ \$1.755	87.75	0.0130
Labor:		
Scarifying	\$182.02	\$0.0269
Shaping	73.00	0.0108
Hauling Trap Rock	132.15	0.0196
Spreading Trap Rock and Screenings	24.50	0.0036
Rolling	194.00	0.0287
	<hr/>	<hr/>
6758 square yards @ \$0.1210..	\$818.03	\$0.1210

Wearing Surface

Materials:		
Amiesite No. 1, 6,316 tons, @		
\$3.928	\$2,480.74	\$0.3671
Amiesite No. 2, 189.2 tons, @ \$3.992	755.38	0.1118
Labor:		
Unloading Amiesite	\$225.82	\$0.0334
Hauling "	386.35	0.0572
Spreading "	243.48	0.0360
Rolling "	116.00	0.0171
	<hr/>	<hr/>
6758 square yards @ \$0.6226.	\$4,207.77	\$0.6226

Surface Finish

Materials:		
Trap Rock Screenings, 8.89 cu.		
yds., @ \$1.755	\$15.60	\$0.0023
Labor:		
Hauling Screenings	10.00	0.0015
Spreading "	25.25	0.0037
	<hr/>	<hr/>
6758 square yards, @ \$0.0075.	\$50.85	\$0.0075

Trimming Shoulders

Labor	\$41.90	\$0.0062
6758 square yards, @ \$0.0062		

Service Test Road

Byberry & Bensalem Turnpike.

Section Two **Station 37 + 00 to 47 + 00**
Bituminous Pavement, Mixing Method
Topeka.

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base.

After cleaning and spiking the old macadam, additional 1½ inch stone was added to give not less than four inches of stone on the top of the telford foundation. Just enough screenings were added to form a coarse grainy base and the road was rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Surface Course or Paving Mixture:

The paving mixture consisted of the following mineral aggregate: Trap rock chips, screenings and sand, within the limits of the following proportions:—

Passing 200 mesh screen..	5 to 11 per cent
“ 40 “ “ ..	18 to 30 “ “
“ 10 “ “ ..	25 to 55 “ “
“ 4 “ “ ..	8 to 22 “ “
“ 2 “ “ ..	less than 10 per cent
Bitumen.....	10 per cent

The asphaltic cement used was Pioneer Road Asphalt and was heated in a tar kettle. The mineral aggregate was heated in a portable Rapid Heater Mixer; the hot asphaltic cement was added and mixed with the mineral aggregate.

The paving mixture was laid at a temperature of 250 to 350 degrees and rolled to a finished depth of two inches with a six-ton tandem roller.

Seal Coat:

From station 42 + 00 to 47 + 00 a seal coat of 1/3 gallon per square yard of Pioneer Road Surface Asphalt was applied at a temperature of 350 degrees and covered with clean trap rock chips passing ¾-inch screen and rolled.

Cost Per Square Yard

Preparation of Base Course.....	\$0.3593
Wearing Surface.....	1.0784
Sand Covering.....	0.0077
Trimming Shoulders.....	0.0792
	<hr/>
	\$1.5246
Seal Coat.....	0.0872
	<hr/>
Cost, including Seal Coat.....	\$1.6118

Detailed Cost Per Square Yard
Preparation of Base Course

Materials:	Per. Sq. Yd.	
1½-inch Trap Rock, 174.35 cu. yds., @ \$2.3121.....	\$403.10	\$0.1926
Trap Rock Screenings, 35.34 cu. yds., @ \$2.3121.....	81.71	0.0391
Labor:		
Scarifying	\$20.02	\$0.0096
Shaping	93.44	0.0445
Spreading Trap Rock.....	82.83	0.0396
Rolling and Watering.....	70.91	0.0339
	<hr/>	<hr/>
2092.7 square yards @ \$0.3593	\$752.01	\$0.3593

Wearing Surface

Materials:		
Trap Rock, 113.84 cu. yds., @ \$3.5944	\$409.18	\$0.1955
Asphaltic Cement, 46920 lbs., @ \$0.013625	637.92	0.3048
Sand, 14.14 cu. yds., @ \$2.312....	32.69	0.0156
Sand, 68.1 cu. yds., @ \$1.9785....	134.74	0.0644
Forms, etc., 100 ft. B. M., @ \$8.50.	.85	0.0004
Coal, 7 tons, @ \$5.00.....	35.00	0.0167
Kerosene, 9 bbls., @ \$6.22.....	55.98	0.0268
Labor:		
Mixing	\$510.02	\$0.2437
Applying Bituminous Materials...	215.21	0.1028
Rolling	225.27	0.1077
	<hr/>	<hr/>
2092.7 square yards @ \$1.0784	\$2256.86	\$1.0784

Trimming Shoulders

Labor	\$165.72	\$0.0792
2092.7 square yards @ \$0.0792		

Sand Covering

Materials:	Per Sq. yd.	
Sand, 4.18 cu. yds., @ \$1.9785.....	\$8.27	\$0.0069
Labor	1.00	0.0008
1203.8 square yards @ \$0.0077	\$9.27	\$0.0077

Seal Coat

Materials:		
½ inch Trap Rock, 7.41 cu. yds., @ \$3.5944.....	\$26.63	\$0.0300
Asphaltic Cement, 2360 lbs., @ \$0.013625	32.16	0.0362
Labor:		
Sweeping	\$.67	\$0.0007
Heating Asphaltic Cement.....	1.02	0.0011
Applying Asphaltic Cement.....	5.75	0.0065
Spreading Chips.....	4.90	0.0055
Rolling	6.37	0.0072
888.9 square yards @ \$0.0872.	\$77.50	\$0.0872

Service Test Road

Byberry & Bensalem Turnpike

Section Three

Station 47 + 00 to 50 + 00

Five-inch Concrete Pavement with Bituminous Top

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base.

The surface was graded to within five and a half inches of the finished grade and additional material was added where required. It was then thoroughly rolled.

Concrete Pavement:

A five-inch concrete base, proportioned 1-3-6 was laid upon the prepared subgrade without joints. The concrete was mixed in a portable rapid mixer, and the surface was finished to grade with a template and trowels and swept with a stiff broom when partially set.

Bituminous Top:

A bituminous top of one-half gallon per square yard of Pioneer Road Surface Asphalt was applied at a temperature of 350 degrees and covered with clean trap rock chips passing $\frac{3}{8}$ -inch screen and rolled with a six-ton tandem roller.

Cost Per Square Yard

Preparation of Base Course	\$0.0571
Concrete Pavement	0.9500
Bituminous Top	0.1261
Trimming Shoulders	0.0130
	\$1.1462
Concrete Pavement per cubic yard	\$6.84

**Detailed Cost Per Square Yard
Preparation of Base Course**

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 4.73 cu. yds., @ \$2.312	\$10.94	\$0.0205
Labor:		
Scarifying	\$7.04	\$0.0132
Shaping	12.46	0.0234
533.3 square yards @ \$0.0571	\$30.44	\$0.0571

Concrete Pavement

Materials:		
1½-inch Trap Rock, 72.75 cu. yds., @ \$2.312	\$168.20	\$0.3154
Sand, 36.4 cu. yds., @ \$1.8432....	67.09	0.1258
Forms, etc., 75-foot B. M., at \$8.50	.64	0.0012
Portland Cement, 90.75 bbls., @ \$1.85	167.89	0.3148
Labor	102.84	0.1928
533.3 square yards, @ \$0.9500	\$506.66	\$0.9500

Bituminous Top

Materials:		
¼-inch Trap Rock, 4.44 cu. yds., @ \$3.5944	\$15.96	\$0.0299
Pioneer Road Surface Asphalt, 2260 lbs., @ \$0.012395.....	28.01	0.0525
Labor:		
Sweeping	\$2.41	\$0.0045
Heating Bituminous Materials ...	5.74	0.0108
Applying Bituminous Materials...	4.35	0.0081
Chipping	5.23	0.0098
Rolling	5.58	0.0105
533.3 square yards @ \$0.1261	\$67.28	\$0.1261

Trimming Shoulders

Labor	\$6.73	\$0.0126
533.3 square yards @ \$0.0126		

Service Test Road

Byberry & Bensalem Turnpike

Section Four

Station 50 + 00 to 52 + 50

Vitrified Block Pavement on Four-inch Concrete Base

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base.

The surface was graded to within nine and one-half inches of the finished grade and additional material was added where required. It was then thoroughly rolled.

Concrete Base and Vitrified Blocks:

A four-inch concrete base with concrete curbs, proportioned 1-3-6, was laid upon the prepared subgrade. The concrete was mixed in a Ransome No. 2 Concrete Mixer, equipped with a charging device.

The sand cushion was spread and rolled with an iron hand roller and shaped with a template. After laying, the vitrified blocks were rolled with a six-ton tandem roller, and grouted to within one-half inch of the surface with cement grout, proportioned 1-1, and covered with sand.

Cost Per Square Yard

Preparation of Foundation Course	\$0.1230
Concrete Base	0.7366
Concrete Curb	0.1196
Sand Cushion	0.1378
Vitrified Blocks	1.2563
Laying Vitrified Blocks	0.1095
Grouting and Covering	0.1067
Trimming Shoulders	0.0636
	\$2.6531

Concrete Curb, per cubic yard...	\$7.653
Concrete Curb, per linear foot...	0.111
Concrete Base, per cubic yard....	6.624

Detailed Cost Per Square Yard

Preparation of Foundation Course

Materials:	Per Sq. Yd.	
1½-inch Limestone, 9 cu. yds., @		
\$2.125	\$19.12	\$0.0413
Labor:		
Scarifying	\$9.69	\$0.0210
Shaping	28.07	0.0607
462.5 square yards, @ \$0.1230	\$56.88	\$0.1230

Concrete Base**Materials:**

Portland Cement, 51.75 bbls., @ \$1.30	\$67.28	\$0.1455
Sand, 24.7 cu. yds., @ \$1.885	46.56	0.1006
Crushed Pebbles, 49.8 cu. yds., @ \$1.8125	90.26	0.1951
Labor	136.63	0.2954
462.5 square yards @ \$0.7366	\$340.73	\$0.7366

Concrete Curb**Materials:**

Portland Cement, 7.25 bbls., @ \$1.30	\$9.43	\$0.0204
Sand, 3.6 cu. yds., @ \$1.885	6.79	0.0147
Crushed Pebbles, 7.1 cu. yds., @ \$1.8125	12.87	0.0278
Forms, etc., 250 ft. B. M., @ \$28..	7.00	0.0131
Labor	19.24	0.0416
462.5 square yards, @ \$0.1196	\$55.33	\$0.1196

Sand Cushion**Materials:**

Sand, 24.6 cu. yds., @ \$1.885....	\$46.37	\$0.1002
Labor	17.37	0.0376
462.5 square yards @ \$0.1378	\$63.74	\$0.1378

Vitrified Blocks**Materials:**

Vitrified Blocks, 19466 @ \$29.85 per M.	\$581.06	\$1.2563
462.5 square yards, @ \$1.2563		

Laying Vitrified Blocks

Labor, Laying and Rolling.....	\$50.67	\$0.1095
462.5 square yards @ \$0.1095		

Grouting and Covering**Materials:**

Portland Cement, 12.5 bbls., @ \$1.30	\$16.25	\$0.0351
Sand, 9 cu. yds., @ \$1.885.....	16.96	0.0367
Labor	16.13	0.0349
462.5 square yards @ \$0.1067.	\$49.34	\$0.1067

Trimming Shoulders

Labor	\$29.41	\$0.636
462.5 square yards @ \$0.0636		

Service Test Road

Byberry & Bensalem Turnpike

Section Five

Station 52 + 50 to 59 + 50

Five-Inch Concrete Pavement With Bituminous Top

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base.

This was removed to a depth of five and one-half inches below the finished grade, and where the original surface was below this grade, the surface was loosened and 1½ inch stone and screenings were spread and rolled to raise the surface to the required grade for the laying of the concrete base.

Concrete Pavement:

A concrete pavement five inches thick, proportioned 1-3-6 and mixed in a No. 2 Ransome Concrete Mixer with a charging device was laid on the prepared subgrade. The surface of the concrete was finished with a template and trowels and was roughened with a stiff broom. One-quarter-inch transverse contraction joints, at right angles to the roadway, were provided at intervals of forty feet. For this purpose one-quarter-inch iron plates were embedded in the concrete and removed as soon as the concrete had hardened. After the concrete was thoroughly set, the joints were filled with Pioneer Road Surface Asphalt.

Bituminous Top:

From station 52 + 50 to 54 + 58 a bituminous top of Ugite was applied. After sweeping the surface of the concrete, 1/6 gallon per square yard of Ugite "A" was applied by hand and 3/8 gallon per square yard of Ugite No. 3 was then applied at a temperature of 280 degrees by a pressure distributor. A coating of 3/4 inch dry trap rock chips followed. Another application of 1/4 gallon per square yard of Ugite No. 3 was then applied at a temperature of 280 degrees by a pressure distributor, which in turn was covered with torpedo sand and rolled with a twelve-ton three-wheel roller.

From station 54 + 58 to 57 + 17 a bituminous top of Tarvia was applied. After sweeping the surface of the concrete, 1/4 gallon per square yard of Tarvia "B" was applied cold, after which 3/8 gallon per square yard of Tarvia "A" was then applied at a temperature of 250 degrees with a pressure distributor and covered with torpedo sand.

From station 57 + 17 to 59 + 50, a bituminous top of

Texaco Asphalt was applied. After sweeping the surface of the concrete, $\frac{1}{8}$ gallon per square yard of Texaco Asphalt cut back with naphtha was applied by hand, after which $\frac{6}{10}$ gallon per square yard of Texaco Asphalt, 55 penetration, was applied by hand at a temperature of 450 degrees and covered with clean trap rock chips passing $\frac{3}{4}$ -inch screen and rolled with a twelve-ton three-wheel roller.

Cost Per Square Yard

Foundation Course.....	\$0.0816
Concrete Pavement.....	0.7464
Shoulders	0.0594
Bituminous Top, Ugite	0.1814
" " Tarvia	0.1215
" " Texaco	0.1632
Foundation Course, Concrete Pavement and Bituminous Top, Ugite.....	1.0094
Foundation Course, Concrete Pavement and Bituminous Top, Tarvia.....	0.9495
Foundation Course, Concrete Pavement and Bituminous Top, Texaco.....	0.9912

Detailed Cost Per Square Yard

Foundation Course

Materials:	Per Sq. yd.	
1 $\frac{1}{2}$ -inch limestone, 31.1 cu. yds., @ \$2.125.....	\$66.09	\$0.0523
Labor:		
Scarifying	\$8.91	\$0.0071
Shaping	21.57	0.0171
Spreading Stone.....	6.50	0.0051
1263.1 square yards @ \$0.0816	\$103.07	\$0.0816

Concrete Pavement

Materials:		
Crushed Pebbles, 170.3 cu. yds., @ \$1.8125.....	\$308.67	\$0.2444
Sand, 84.3 cu. yds., @ \$1.885.....	158.90	0.1258
Portland Cement, 176 bbls., @ \$1.30	228.80	0.1812
Lumber, 150 ft. B. M., @ \$28.00...	4.20	0.0033
Labor	242.01	0.1917
1263.1 square yards @ \$0.7464	\$942.58	\$0.7464

Shoulders

Materials:	Per Sq. yd.	
Cinders, 5 tons, @ \$1.25.....	\$6.25	\$0.0049
Labor	68.79	0.0545
1263.1 square yards @ \$0.0594	\$75.04	\$0.0594

Bituminous Top, Ugite
Station 52 + 50 to 54 + 58

Materials:

Ugite "A," 75 gallons, @ \$0.07...	\$5.25	\$0.0134
Ugite No. 3, 250 gallons, @ \$0.08...	20.00	0.0512
¾-inch Trap Rock, 7 tons, @ \$1.90	13.30	0.0340
Torpedo Sand, 6 tons, @ \$2.95....	16.50	0.0422

Labor:

Hauling	\$10.40	\$0.0266
Sweeping	0.75	0.0019
Applying Bituminous Materials...	2.50	0.0064
Spreading Chips.....	2.25	0.0057

391 square yards @ \$0.1814..	\$70.95	\$0.1814
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Bituminous Top, Tarvia
Station 54 + 58 to 57 + 17

Materials:

Tarvia "B," 91 galons, @ \$0.07...	\$6.37	\$0.0139
Tarvia "A," 191 gallons, @ \$0.085.	16.24	0.0354
Torpedo Sand, 9.5 tons, @ \$2.75..	26.13	0.0569

Labor:

Hauling	\$3.90	\$0.0085
Sweeping75	0.0016
Applying Bituminous Materials...	1.62	0.0036
Spreading Chips.....	.75	0.0016

459 square yards @ \$0.1215..	\$55.76	\$0.1215
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Bituminous Top, Texaco
Station 57 + 17 to 59 + 50

Materials:

Texaco Asphalt, 270 gallons, @ \$0.085	\$22.95	\$0.0555
Naphtha, 36 gallons, @ \$0.18....	6.48	0.0157
Trap Rock Chips, 6 tons, @ \$2.20..	13.20	0.0320

Labor:

Hauling	\$3.00	\$0.0072
Sweeping50	0.0012
Heating Bituminous Materials....	4.00	0.0099
Applying Bituminous Materials...	9.12	0.0221
Spreading Chips.....	2.13	0.0051
Rolling	6.00	0.0145

413 square yards @ \$0.1632..	\$67.38	\$0.1632
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Service Test Road

Byberry & Bensalem Turnpike

Section Six

Station 59 + 50 to 72 + 00

Bituminous Pavement Mixing Method

Filbertine

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, additional 1½-inch stone was added to give not less than four inches of stone on the top of the telford foundation. Just enough screenings were added to form a course grainy base and the road was rolled and puddled until thoroughly cemented.

Surface Course or Paving Mixture:

The paving mixture consisted of the following mineral aggregate: ¾-inch limestone, sand and Portland Cement. The mineral aggregate was combined with asphaltic cement within the following limits:

Limestone, ¾-inch 55 to 65 per cent.

Sand, coarse to fine, and cement. . 35 to 45 per cent.

Asphaltic Cement, 70 to 80 penetration, 6 6/10 per cent.

The paving mixture was prepared in a stationary plant of six hundred square yards capacity, erected by the contractor at the south side of the road at Station 115.

The paving mixture was laid at a temperature of 250 to 350 degrees and rolled to a finished depth of two inches with a six-ton tandem roller.

Cost Per Square Yard

Preparation of Foundation Course	\$0.4569
Wearing Surface	0.7584
Trimming Shoulders	0.0428
	<hr/>
	\$1.2581

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 236 cu. yds., @ \$2.43	\$573.48	\$0.2532
Trap Rock Screenings, 49.7 cu. yds., @ \$2.363	116.54	0.0514
Labor:		
Scarifying	92.93	\$0.0410
Spreading Trap Rock	114.05	0.0504
Rolling and Watering	137.94	0.0609
2265 square yards, @ \$0.4569	\$1034.94	\$0.4569

Wearing Surface

Materials:		
¾-inch Limestone, 136.4 cu. yds., @ \$2.145	\$292.58	\$0.1292
Asphalt Sand, 54.2 cu. yds., @ \$1.74	94.31	0.0416
Coarse Sand, 53.7 cu. yds., @ \$1.885	101.22	0.0447
Asphaltic Cement, 41,110 lbs., @ \$0.012917	531.04	0.2344
Portland Cement, 35 bbl., @ \$1.30	45.50	0.0201
Forms, etc., 500 ft. B. M., @ \$28.	14.00	0.0062
Coal, 24 tons, @ \$4.....	96.00	0.0424
Wood, 1 1/3 cords, @ \$7.50.....	10.00	0.0044
Labor:		
Mixing	180.44	\$0.0797
Applying Bituminous Materials ..	197.44	0.0872
Rolling	42.11	0.0186
Hauling Bituminous Materials ...	113.10	0.0499
2265 square yards, @ \$0.7584	\$1717.74	\$0.7584

Trimming Shoulders

Materials:		
Cinders, 5 tons, @ \$1.25.....	\$6.25	\$0.0027
Labor	90.76	0.0401
2265 square yards, @ \$0.0428	\$97.01	\$0.0428

Service Test Road

Byberry & Bensalem Turnpike

Section Seven

Station 72 + 00 to 84 + 50

Bituminous Macadam, Mixing Method

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, additional 1½-inch stone was added to give not less than four inches of stone on the top of the telford foundation. Just enough screenings were added to form a coarse grainy base and the road was rolled and puddled until thoroughly cemented.

Surface Course or Paving Mixture:

The paving mixture consisted of the following mineral aggregate: Trap Rock, run of crusher and passing a 1¼-inch screen, two parts; sand, one part; mineral dust, 5 per cent of the above; asphaltic cement, 5.2 per cent.

This mineral aggregate was mixed with the asphaltic cement in a stationary asphalt plant erected by the contractor at the south side of the road at Station 115. The paving mixture was laid at a temperature of 250 to 350 degrees and rolled to a finished depth of two inches with a six-ton tandem roller. After the rolling was completed, that portion not covered by the seal coat was swept and covered with dry sand.

Seal Coat:

From Station 72+00 to 78+00 a seal coat of one-quarter gallon per square yard of asphaltic cement was applied at a temperature of 350 degrees and covered with clean trap rock chips, passing ¾-inch screen and rolled.

Cost Per Square Yard

Foundation Course	\$0.5067
Wearing Surface	0.7934
Sand Covering	0.0073
Trimming Shoulders	0.0200
	<hr/>
	\$1.3274
Seal Coat	0.1017
Cost, including Seal Coat	<hr/>
	\$1.4291

Detailed Cost Per Square Yard**Materials:** Per Sq. Yd.

1½-inch Trap Rock, 243.4 cu. yds., @ \$2.43	\$591.46	\$0.2620
Trap Rock Screenings, 49.5 cu. yds., @ \$2.295	113.60	0.0503

Labor:

Scarifying	\$84.64	\$0.0375
Spreading Stone	179.34	0.0794
Rolling and Watering	175.02	0.0775

2257.71 sq. yds., @ \$0.5067..	\$1144.06	\$0.5067
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Wearing Surface**Materials:**

Trap Rock, 1¼-inch and smaller, 162.5 cu. yds., @ \$2.43.....	\$394.88	\$0.1749
Coarse Sand, 19.9 cu. yds., @ \$1.885	37.51	0.0166
Asphalt Sand, 37.1 cu. yds., @ \$1.74	64.55	0.0286
Asphaltic Cement, 31,000 lbs., @ \$0.012867	400.45	0.1774
Portland Cement, 48 bbls., @ \$1.30	62.40	0.0276
Lumber, 500 ft. B. M., @ \$28....	14.00	0.0062
Coal, 32 tons, @ \$4.....	128.00	0.0567
Wood, 1 1-3 cords, @ \$7.50.....	10.00	0.0044

Labor:

Mixing	\$255.00	\$0.1129
Hauling Bituminous Materials....	143.40	0.0635
Applying Bituminous Materials ..	225.67	0.1000
Rolling Bituminous Materials ...	55.53	0.0246

2257.71 sq. yds., @ \$0.7934..	\$1791.39	\$0.7934
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Seal Coat**Materials:**

Trap Rock Chips, 13.3 cu. yds., @ \$3.4425	\$45.79	\$0.0425
Asphaltic Cement, 2802 lbs., @ \$0.012867	36.19	0.0336

Labor:

Sweeping	\$ 0.60	\$0.0006
Applying Bituminous Materials...	14.66	0.0136
Chipping	9.43	0.0088
Rolling	2.83	0.0026

1077.06 sq. yds., @ \$0.1017..	\$109.50	\$0.1017
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Sand Covering**Materials:**

Sands, 4.1 cu. yds., @ \$1.885.....	\$7.73	\$0.0065
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Labor	1.01	0.0008
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1180.65 sq. yds., @ \$0.0073..	\$8.74	\$0.0073
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Trimming Shoulders**Materials:**

Cinders, 5 tons, @ \$1.25.....	\$ 6.25	\$0.0025
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Labor	43.69	0.0175
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2257.71 sq. yds., @ \$0.0200..	\$49.94	\$0.0200
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Service Test Road

Byberry & Bensalem Turnpike

Section Eight **Station 84 + 50 to 87 + 50**
Vitrified Block Pavement on Four-inch Concrete Base

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base.

The surface was graded to within nine and one-half inches of the finished grade, and additional material was added where required. It was then thoroughly rolled.

Concrete Base and Vitrified Blocks:

A four-inch concrete base with concrete curbs, proportioned 1-3-6, was laid upon the prepared subgrade. The concrete was mixed in a Ramsome No. 2 Concrete Mixer, equipped with a charging device.

The sand cushion was spread and rolled with an iron hand roller and shaped with a template. After laying, the vitrified blocks were rolled with a six-ton tandem roller, and grouted to within one-half inch of the surface with cement grout, proportioned 1-1, and covered with sand.

Cost Per Square Yard

Preparation of Foundation Course	\$0.1957
Concrete Base	0.6866
Concrete Curb	0.1142
Sand Cushion	0.1176
Vitrified Blocks	1.2559
Laying Vitrified Blocks	0.1024
Grouting and Covering	0.0906
Trimming Shoulders	0.0402
	\$2.6032
Concrete Base, per cubic yard	\$6.179
Concrete Curb, per cubic yard	6.943
Concrete Curb, per linear foot	0.102

Detailed Cost Per Square Yard Preparation of Foundation Course

Materials:	Per Sq. Yd.	
1½-inch Limestone, 27.6 cu. yds., @ \$2	\$55.20	\$0.1031
Labor:		
Scarifying	\$ 7.31	\$0.0137
Shaping	28.28	0.0528
Spreading 1½-inch Limestone ...	4.50	0.0084
Rolling and Watering	9.49	0.0177
535.5 square yards, @ \$0.1957	\$104.78	\$0.1957

Concrete Base**Materials:**

Crushed Pebbles, 57.7 cu. yds., @ \$1.8125	\$104.58	\$0.1953
Sand, 28.4 cu. yds., @ \$1.885	53.53	0.1000
Portland Cement, 60 bbls., @ \$1.30	78.00	0.1456
Labor	131.56	0.2457
535.5 square yards, @ \$0.6866	\$367.67	\$0.6866

Concrete Curb**Materials:**

Crushed Pebbles, 8.5 cu. yds., @ \$1.8125	\$15.40	\$0.0287
Sand, 4.2 cu. yds., @ \$1.885	7.92	0.0147
Portland Cement, .8.75 bbls., @ \$1.30	11.38	0.0213
Forms, etc., 250 ft. B. M., @ \$28.	7.00	0.0131
Labor	19.47	0.0364
535.5 square yards, @ \$0.1142	\$61.17	\$0.1142

Sand Cushion**Materials:**

Sand, 29.6 cu. yds., @ \$1.885	\$55.80	\$0.1042
Labor	7.18	0.0134
535.5 square yards, @ \$0.1176	\$62.98	\$0.1176

Vitrified Blocks**Materials:**

Vitrified Blocks, 22,530 @ \$29.85 per M.	\$672.52	\$1.2559
535.5 square yards, @ \$1.2559		

Laying Vitrified Blocks

Labor	\$54.86	\$0.1024
535.5 square yards, @ \$0.1024.		

Grouting and Covering**Materials:**

Portland Cement, 15 bbls., @ \$1.30	\$19.50	\$0.0364
Sand, 9.5 cu. yds., @ \$1.885	17.91	0.0334
Labor	11.11	0.0208
535.5 square yards, @ \$0.0906...	\$48.52	\$0.0906

Trimming Shoulders**Materials:**

Cinders, 5 tons, @ \$1.25	\$6.25	\$0.0117
Labor	15.26	0.0285
535.5 square yards, @ \$0.0402...	\$21.51	\$0.0402

Section Nine **Station 87 + 50 to 94 + 00**
Five-Inch Concrete Pavement With Bituminous Top

The foundation course was originally old waterbound macadam with a telford base. This was removed to a depth of five and one-half inches below the finished grade, and where the original surface was below this grade the surface was spiked and 1½ inch stone and screenings were spread and rolled to raise the surface to the proper grade.

A concrete base, five inches thick, was laid upon the subgrade. This concrete was proportioned 1-3-6 and was mixed by a No. 2 Ransome Concrete Mixer equipped with a charging device. The surface of the concrete was finished with a template and trowels and was roughened with a stiff broom.

Transverse contraction joints, at right angles to the line of the roadway, were provided at intervals of forty feet. For this purpose two pieces of tar felt paper were embedded in the concrete at each joint and trimmed to the grade of the concrete surface when it was finished.

From station 87 + 50 to 92 + 00, a bituminous top was laid. From station 87 + 50 to 90 + 00, 4/10 gallon per square yard of Dolarway Bitumen was applied at a temperature of 270 degrees and covered with torpedo sand.

From station 90 + 00 to 90 + 70, 1/8 gallon per square yard of Bicomac was spread on the surface of the concrete pavement. A mixture of trap rock chips, trap rock dust and Bicomac was then applied and rolled with a hand roller. One-half of this surface was covered with trap rock dust and rolled lightly. The other half was covered with trap rock chips and rolled lightly.

From station 90 + 70 to 91 + 35, 4/10 gallon per square yard of asphalt cut back with naphtha was spread upon the surface of the concrete pavement and the naphtha was burned out. Trap rock chips were then spread and rolled into this asphalt coating with a hand roller.

From station 91 + 35 to 92 + 00, $\frac{1}{8}$ gallon per square yard of Bicomac was spread upon the surface of the concrete pavement, after which $\frac{4}{10}$ gallon per square yard of asphalt was applied at a temperature of 400 degrees and covered with clean trap rock chips passing $\frac{3}{4}$ -inch screen.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.1680
Concrete Pavement	0.8792
Trimming Shoulders	0.0391
	<hr/>
	\$1.0863
Bituminous Top Dolarway	\$0.1689
" " Bicomac Mixing Method.....	0.1203
" " Cut Back Asphalt Fired....	0.1057
" " Asphalt and Bicomac.....	0.1004

Detailed Cost Per Square Yard Preparation of Foundation Course

Materials:	Per Sq. Yd.	
1 $\frac{1}{2}$ -inch Limestone, 524 cu. yds., @ \$2.00	\$104.80	\$0.0845
Labor:		
Scarifying	\$71.65	\$0.0577
Shaping	1.51	0.0012
Spreading Stone	25.03	0.0202
Rolling and Watering	5.46	0.0044
	<hr/>	<hr/>
1240.7 square yards @ \$0.1680	208.45	\$0.1680

Concrete Base

Materials:		
Crushed Pebbles, 167.6 cu. yds., @ \$1.8125	\$303.78	\$0.2448
Gravel, 82.8 cu. yds., @ \$1.885....	156.08	0.1258
Portland Cement, 173 bbls., @ \$1.30	224.90	0.1813
Forms, etc., 300 ft. B. M., @ \$28.00	8.40	0.0068
Labor	\$397.67	\$0.3205
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1240.7 square yards @ \$0.8792	\$1090.83	\$0.8792

Trimming Shoulders

Materials:	Per Sq. Yd.	
Cinders, 15 tons, @ \$1.25.....	\$18.75	\$0.0151
Labor	29.77	0.0240
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1240.7 square yards @ \$0.0391	\$48.52	\$0.0391

Bituminous Top
Station 87 + 50 to 90 + 00

Dolarway

Materials:

Dolarway Bitumen, 200 gallons, @ \$0.095	\$19.00	\$0.0417
Torpedo Sand, 7 tons, @ \$2.75....	19.25	0.0422

Labor:

Hauling	\$22.00	\$0.0482
Heating Bituminous Materials...	2.51	0.0055
Applying Bituminous Materials...	8.38	0.0184
Chipping Bituminous Materials...	5.86	0.0129

456 square yards @ \$0.1689..	\$77.00	\$0.1689
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Bituminous Top
Station 90 + 00 to 90 + 70

Bicomac, Mixing Method

Materials:

Bicomac, 72 gallons, @ \$0.100....	\$7.20	\$0.0581
1/2-inch Trap Rock and Trap Rock chips, 2 1/2 tons, @ \$2.20	5.50	0.0444

Labor	3.40	0.0274
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124 square yards @ \$0.1299..	\$16.10	\$0.1299
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Bituminous Top
Station 90 + 70 to 91 + 35
Cut Back Asphalt. Fired

Materials:

		Per Sq. Yd.
Bicomac, 7 gallons, @ \$0.10.....	\$0.70	\$0.0061
Cut Back Asphalt, 58 gallons, @ \$0.11	6.38	0.0555
Trap Rock Chips 1 1/2 tons, @ \$2.20	3.30	0.0287

Labor	3.15	0.0274
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115 square yards @ \$0.1177..	\$13.53	\$0.1177
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Bituminous Top
Station 91 + 35 to 92 + 00
Asphalt and Bicomac

Materials:

Bicomac, 46 gallons, @ \$0.10....	\$4.60	\$0.0241
Asphalt, 60 gallons, @ \$0.115....	6.90	0.0362
Trap Rock Chips, 2 tons, @ \$2.20..	4.40	0.0230

Labor	5.23	0.0274
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191 square yards @ \$0.1107..	\$21.13	\$0.1107
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Section Ten, Station 94 + 00 to 97 + 00
Vitrified Block Pavement on Four Inch Concrete Base

The foundation course was originally old waterbound macadam with a telford base. The surface was graded to within nine and one-half inches of the finished grade and additional material was added where required. It was then thoroughly rolled.

A four-inch concrete base with concrete curbs, proportioned 1-3-6, was laid upon the prepared subgrade. The concrete was mixed in a Ransome No. 2 concrete mixer equipped with a charging device. The sand cushion was spread and rolled with an iron hand roller, and shaped with a template. After laying, the vitrified blocks were rolled with a six ton tandem roller and grouted to within one-half inch of the surface with cement grout, proportioned 1-1, and covered with sand.

Preparation of Foundation Course.....	\$0.1125
Concrete Base	0.6898
Concrete Curb	0.1151
Sand Cushion	0.1176
Vitrified Blocks	1.2560
Laying Vitrified Blocks.....	0.0777
Grouting and Covering.....	0.1047
Trimming Shoulders	0.0798
	<hr/>
	\$2.5532
Concrete Base, per cubic yard.....	\$6.208
Concrete Curb, per lineal foot.....	0.1025
Concrete Curb, per cubic yard.....	7.001

Materials:	Per Sq. Yd.	
1½-inch Limestone, 10.4 cu. yds., @ \$2.00	\$20.80	\$0.0389
Labor:		
Scarifying	\$15.81	\$0.0296
Shaping	14.91	0.0279
Spreading 1½-inch Limestone....	3.50	0.0066
Rolling and Watering	5.09	0.0095
534.3 square yards @ \$0.1125	\$60.11	\$0.1125

Concrete Base**Materials:**

Crushed Pebbles, 57.5 cu. yds., @ \$1.8125	\$104.22	\$0.1951
Sand, 28.4 cu. yds., @ \$1.885	53.53	0.1002
Portland Cement, 59 bbls., @ \$1.30	76.70	0.1435
Labor	134.14	0.2510
534.3 square yards at \$0.6898....	\$368.59	\$0.6898

Concrete Curb**Materials:**

Crushed Pebbles, 8.5 cu. yds., @ \$1.8125	\$15.41	\$0.0288
Sand, 4.2 cu. yds., @ \$1.885	7.92	0.0148
Portland Cement, 8.75 bbls., @ \$1.30	11.38	0.0213
Forms, etc., 250 ft. B. M., @ \$28.00	7.00	0.0131
Labor	19.83	0.0371
534.3 square yards @ \$0.1151....	\$61.54	\$0.1151

Sand Cushion**Materials:**

Sand, 29.6 cu. yds., @ \$1.885....	\$55.80	\$0.1044
Labor	7.05	0.0132
534.3 square yards @ \$0.1176....	\$62.85	\$0.1176

Vitrified Blocks**Material:**

Vitrified Blocks, 22482 @ \$29.85 per M	\$671.09	\$1.2560
534.3 square yards @ \$1.256.	.	.

Laying Vitrified Blocks

Labor—Laying and Rolling	\$41.51	\$0.0777
534.3 square yards @ \$0.0777		

Grouting and Covering**Materials:**

Portland Cement, 15 bbls., @ \$1.30	\$19.50	\$0.0365
Sand, 9.4 cu. yds., @ \$1.885	17.72	0.0332
Labor	18.71	0.0350
534.3 square yards @ \$0.1047	\$55.93	\$0.1047

Trimming Shoulders**Materials:**

Cinders, 5 tons, @ \$1.25.....	\$6.25	\$0.0117
Labor	36.37	0.0681
534.3 square yards @ \$0.0798	\$42.62	\$0.0798

Service Test Road

Byberry and Bensalem Turnpike

Section Eleven

Station 97 + 00 to 103 + 00

Bituminous Pavement Mixing Method

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, additional 1½-inch stone was added to give not less than four inches on the top of the telford foundation. Just enough screenings were added to form a coarse grainy base and the road was rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Surface Course or Paving Mixture:

The paving mixture consisted of the following mineral aggregate: Trap Rock, run off crusher, passing a one-inch screen and retained on a one-quarter-inch screen. The mineral aggregate was mixed with 4.8 per cent. of asphaltic cement in a stationary asphalt plant erected by the contractor at the south side of the road at Station 115. The paving mixture was laid at a temperature of 250 to 350 degrees and rolled to a finished depth of two inches with a six-ton tandem roller.

Seal Coat:

A Seal Coat of ¼ gallon per square yard of asphaltic cement was applied at a temperature of 350 degrees, and covered with clean trap rock chips passing a ¾-inch screen and rolled.

Cost Per Square Yard

Foundation Course	\$0.4934
Wearing Surface	0.6460
Seal Coat	0.1050
Trimming Shoulders	0.0392
	\$1.2836

**Detailed Cost Per Square Yard
Foundation Course**

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 146.3 cu. yds., @ \$2.43	\$355.51	\$0.3186
Trap Rock Screenings, 24.5 cu. yds., @ \$2.295.....	56.23	0.0504
Labor:		
Scarifying	\$44.22	\$0.0396
Shaping	17.12	0.0154
Spreading Stone	25.04	0.0224
Rolling and Watering	52.47	0.0470
1115.9 square yards at \$0.4934	\$550.59	\$0.4934

Wearing Surface

Materials:		
¾-inch Trap Rock, 92 cu. yds., @ \$2.43	\$223.56	\$0.2003
Asphaltic Cement, 12040 lbs., @ \$0.012867	155.52	0.1394
Coal, 16 tons, @ \$4.00.....	64.00	0.0574
Wood, 2/3 cords, @ \$7.50.....	5.00	0.0045
Forms, etc., 200 ft. B. M., @ \$28.00	5.60	0.0050
Labor:		
Mixing	86.64	0.0776
Hauling Bituminous Materials....	60.50	0.0542
Applying Bituminous Materials...	102.07	0.0915
Rolling	17.99	0.0161
1115.9 square yards at \$0.6460	\$720.88	\$0.6460

Seal Coat

Materials:		
Trap Rock Chips, 13.3 cu. yds., @ \$3.4425	\$45.79	0.0410
Asphaltic Cement, 3340 lbs., at \$0.012867	43.14	0.0387
Labor:		
Sweeping	\$2.63	\$0.0024
Heating Bituminous Materials....	6.56	0.0059
Applying Bituminous Materials...	7.41	0.0066
Chipping	5.98	0.0053
Rolling	5.68	0.0051
1115.9 square yards @ \$0.1050	\$117.19	\$0.1050

Trimming Shoulders

Materials:		
Cinders, 10 tons, @ \$1.25.....	\$12.50	\$0.0112
Labor	31.25	0.0280
1115.9 square yards @ \$0.0392	\$43.75	\$0.0392

Service Test Road

Byberry and Bensalem Turnpike

Section Twelve

Station 103 + 00 to 109 + 00

Bituminous Pavement Mixing Method

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, additional 1½-inch stone was added to give not less than four inches of stone on the top of the telford foundation. Just enough screenings were added to form a coarse grainy base and the road was rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Surface Course or Paving Mixture:

The paving mixture consisted of the following mineral aggregate: Bank gravel, with no stone over one inch in its largest dimensions, and sand.

The mineral aggregate was mixed with 8.1 per cent. of asphaltic cement in a stationary asphalt plant erected by the contractor at the roadside at Station 115. The paving mixture was laid at a temperature of 250 to 350 degrees and rolled to a finished depth of two inches with a 6-ton tandem roller.

From Station 103 + 00 to 106 + 00, a seal coat of one-quarter gallon per sq. yd. of asphaltic cement was applied at a temperature of 350 degrees and covered with clean trap rock chips passing a ¾-inch screen and rolled.

From Station 106 + 00 to 109 + 00 the surface of the road was covered with sand.

Cost Per Square Yard

Foundation Course	\$0.4889
Wearing Surface	0.8542
Sand Covering	0.0086
Trimming Shoulders	0.1288
	\$1.4805
Seal Coat	0.1278
coat, including Seal Coat.....	\$1.6083

Detailed Cost Per Square Yard

Foundation Course

Materials:

		Per Sq. Yd.
1½-inch Trap Rock, 141 cu. yds.,		
@ \$2.43	\$342.63	\$0.3096
Trap Rock Screenings, 24.3 cu. yds.,		
@ \$2.295	55.77	0.0504

Labor:

Scarifying	\$10.48	\$0.0095
Shaping	16.84	0.0152
Spreading Stone	57.25	0.0517
Rolling and Watering	58.14	0.0525
1106.67 sq. yds. @ \$0.4889...	\$541.11	\$0.4889

Wearing Surface**Materials:**

Bank Gravel, 97.2 cu. yds., @ \$2.4375	\$236.93	\$0.2141
Sand, 25.4 cu. yds., @ \$1.74.....	44.20	0.0399
Asphaltic Cement, 25310 lbs., @ \$0.012917	326.94	0.2954
Coal, 16 tons, @ \$4.00.....	64.00	0.0578
Wood, 2/3 cords, @ \$7.50.....	5.00	0.0045
Forms, etc., 200 inches B. M., @ \$28.00	5.60	0.0051

Labor:

Mixing	\$73.05	\$0.0660
Hauling Bituminous Materials....	57.30	0.0518
Applying Bituminous Materials...	111.24	0.1005
Rolling	21.10	0.0191
1106.67 sq. yds. @ \$0.8542..	\$945.36	\$0.8542

Seal Coat**Materials:**

Trap Rock Chips, 6.7 cu. yds., @ \$3.4425	\$23.06	\$0.0415
Asphaltic Cement, 2858 lbs., @ \$0.012917	36.92	0.0665

Labor:

Heating Bituminous Materials ...	\$2.50	\$0.0045
Applying	2.73	0.0049
Chipping	3.61	0.0065
Rolling	2.14	0.0039
553.4 sq. yds. @ \$0.1278.....	\$70.96	\$0.1278

Sand Covering**Materials:**

Sand, 1.9 cu. yds., @ \$1.885.....	\$3.58	\$0.0065
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Labor	1.19	0.0021
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553.4 sq. yds. @ \$0.0086.....	\$4.77	\$0.0086
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Trimming Shoulders**Materials:**

Cinders, 55 tons, @ \$1.25.....	\$68.75	\$0.0621
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Labor	73.77	0.0667
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1106.67 sq. yds. @ \$0.1288...	\$142.52	\$0.1288
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Service Test Road

Byberry and Bensalem Turnpike

Section Thirteen Station 109 + 00 to 112 + 50

Vitrified Block Pavement on Four-inch Concrete Base

Foundation Course:

The foundation course was originally old water-bound macadam with a telford base. The surface was graded to within nine and one-half inches of the finished grade and additional material was added where required. It was then thoroughly rolled.

Concrete Base and Vitrified Blocks:

A four-inch concrete base with concrete curbs, proportioned 1-3-6, was laid upon the prepared sub-grade. The concrete was mixed in a Ransome No. 2 concrete mixer, equipped with a charging device.

The sand cushion was spread and rolled with an iron hand roller, and shaped with a template. After laying, the vitrified blocks were rolled with a six-ton tandem roller and grouted to within one-half inch of the surface with cement grout proportioned 1-1 and covered with sand.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.3044
Concrete Base	0.7446
Concrete Curb	0.1235
Sand cushion	0.1309
Vitrified Blocks	1.2557
Laying Vitrified Blocks.....	0.1288
Grouting and Covering	0.0883
Trimming Shoulders	0.0681
	\$2.8443
Concrete Base, per cubic yard.....	\$6.702
Concrete Curb, per cubic yard.....	7.496
Concrete Curb, per linear foot.....	0.1096

Detailed Cost Per Square Yard

Preparation of Foundation Course

Materials:	Per Sq. Yd.	
1½-inch Limestone, 45.6 cu. yds.,		
@ \$2.00	\$91.20	\$0.1468
Labor:		
Scarifying	\$41.77	\$0.0672
Shaping	35.19	0.0566
Spreading 1½-inch Limestone....	8.50	0.0137
Rolling and Watering.....	12.50	0.0201
621.4 square yards @ \$0.3044	\$189.16	\$0.3044

Concrete Base**Materials:**

Crushed Pebbles, 67. cu. yds., @ \$1.8125	\$121.44	\$0.1954
Sand, 33.1 cu. yds., @ \$1.885.....	62.39	0.1004
Portland Cement, 69.75 bbls., @ \$1.30	90.68	0.1459
Labor	188.23	0.3029
621.4 square yards @ \$0.7446	<u>\$462.74</u>	<u>\$0.7446</u>

Concrete Curb**Materials:**

Crushed Pebbles, 10.1 cu. yds., @ \$1.8125	\$18.31	\$0.0295
and, 4.5 cu. yds., @ \$1.885.....	8.48	0.0136
Portland Cement, 10.5 bbls., @ \$1.30	13.65	0.0220
Forms, etc., 300 ft. B. M., @ \$28.00	8.40	0.0135
Labor	27.92	0.0449
621.4 square yards @ \$0.1235	<u>\$76.76</u>	<u>\$0.1235</u>

Sand Cushion**Materials:**

Sand, 36 cu. yds., @ \$1.885.....	\$67.86	\$0.1092
Labor	13.51	0.0217
621.4 square yards @ \$0.1309	<u>\$81.37</u>	<u>\$0.1309</u>

Vitrified Blocks**Materials:**

Vitrified Blocks, 26140 @ \$29.85 per M	\$780.28	\$1.2557
621.4 square yards @ \$1.2557		

Laying Vitrified Blocks**Labor:**

Laying and Rolling.....	\$80.05	\$0.1288
621.4 square yards @ \$0.1288		

Grouting and Covering**Materials:**

Portland Cement, 17.5 bbls., @ \$1.30	\$22.75	\$0.0366
Sand, 10.9 cu. yds., @ \$1.885.	20.55	0.0331
Labor	11.55	0.0186
621.4 square yards @ \$0.0883	<u>\$54.85</u>	<u>\$0.0883</u>

Trimming Shoulders**Materials:**

Cinders, 5 tons, @ \$1.25.....	\$6.25	\$0.0101
Labor	36.06	0.0580
621.4 square yards @ \$0.0681	<u>\$42.31</u>	<u>\$0.0681</u>

Service Test Road

Byberry and Bensalem Turnpike

Section Fourteen

Station 112 + 50 to 118 + 00

Five-inch Hassam Concrete Pavement With Bituminous Top

Foundation Course:

The foundation course was originally old water-bound macadam with a telford base. This was removed to a depth of five and one-half inches below the finished grade and where the original surface was lower than this grade, the surface was loosened and 1½-inch stone and screenings were spread and rolled to raise the surface to the required grade for the laying of the concrete pavement.

Concrete Pavement:

Stone was spread upon the foundation course and rolled with a six-ton tandem roller to a finished depth of five inches. From Station 112 + 50 to 114 + 85, 2½-inch trap rock was used.

From Station 114 + 85 to 116 + 00, 1½-inch trap rock was used.

From Station 116 + 00 to 118 + 00, crushed pebbles in size from one to two inches were used.

Cement grout, proportioned 1-2, was mixed in a Hassam Grout Mixer and poured on the stone until the grout flushed to the surface. As soon as the grout had settled, the road was rolled with a six-ton tandem roller.

Bituminous Top:

A bituminous top was laid upon the concrete surface. One-fourth gallon per square yard of Ucite No. 3 was applied at a temperature of 250 degrees, by a pressure distributor which was covered with clean trap rock chips passing one-half inch screen and rolled with a six-ton tandem roller, after which one-fourth gallon per square yard of an asphaltic cement was then applied at a temperature of 425 degrees by a pressure distributor and covered with clean trap rock chips passing one-half inch screen and rolled.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.2255
Concrete Pavement	0.8919
Bituminous Top	0.1331

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Materials:	Per Sq. Yd.	
1½-inch Limestone, 48 cu. yds., @ \$2.00	\$96.00	\$0.0977
Labor:		
Shaping	56.25	0.0572
Spreading Stone	35.63	0.0362
Rolling and Watering.....	33.85	0.0344
983.1 square yards @ \$0.2255	\$221.73	\$0.2255

Grouted Concrete Pavement

Materials:		
1½-inch Trap Rock, 28.4 cu. yds., @ \$2.43	\$69.01	\$0.0702
2½-inch Trap Rock, 58.9 cu. yds., @ \$2.43	143.13	0.1456
Crushed Pebbles, 44.9 cu. yds., @ \$1.8125	89.54	0.0911
Sand, 46.7 cu. yds., @ \$1.74	81.26	0.0827
Portland Cement, 175 bbls., @ \$1.30	227.50	0.2314
Forms, etc., 275 ft. B. M. @ \$28.00	7.70	0.0078
Labor:		
Concrete Pavement	97.44	0.0991
Grouting	161.27	0.1640
983.1 square yards @ \$0.8919	\$876.85	\$0.8919

Bituminous Top

Materials:		Per Sq. Yd.
Ugite No. 3, 246 gallons, at \$0.08.	\$19.68	\$0.0200
Asphaltic Cement, 246 gallons, @ \$0.1095	26.94	0.0274
Trap Rock Chips, 20 tons, @ \$2.20	44.00	0.0447
Labor:		
Sweeping	5.80	0.0059
Heating Bituminous Materials....	11.31	0.0115
Applying Bituminous Materials...	6.20	0.0063
Spreading Chips	9.50	0.0097
Rolling	7.40	0.0076
983.1 square yards @ \$0.1331	\$130.83	\$0.1331

Service Test Road

Byberry and Bensalem Turnpike

Section Fifteen

Station 118 + 00 to 121 + 00

Vitrified Block Pavement on Four-Inch Concrete Base

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. The surface was graded to within nine and one-half inches of the finished grade and additional material was added where required. It was then thoroughly rolled.

Concrete Base and Vitrified Blocks:

A four-inch concrete base with concrete curbs, proportioned 1-3-6, was laid upon the prepared subgrade. The concrete was mixed in a Ransome No. 2 concrete mixer, equipped with a charging device. The sand cushion was spread, rolled with an iron hand roller, and shaped with a template. After laying, the vitrified blocks were rolled with a six-ton tandem roller, grouted to within one-half inch of the surface with cement grout, proportioned 1-1, and covered with sand.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.1618
Concrete Base	0.6775
Concrete Curb	0.1116
Sand Cushion	0.1270
Vitrified Block	1.2560
Laying Vitrified Blocks	0.0446
Grouting and Covering	0.0975
Trimming Shoulders	0.1641
	\$2.6401
Concrete Base, per cubic yard.....	\$6.098
Concrete Curb, per lineal ft.....	0.0992
Concrete Curb, per cubic yard.....	6.786

Detailed Cost Per Square Yard

Preparation of Foundation Course

Materials:		Per Sq. Yd.
1½-inch Limestone, 7 cubic yds.,		
@ \$2.00	\$14.00	\$0.0262
Labor:		
Scarifying	\$48.26	\$0.0903
Shaping	19.59	0.0367
Rolling and Watering	4.61	0.0086
534.3 square yards @ \$0.1618	\$86.46	\$0.1618

Concrete Base**Materials:**

Crushed Pebbles, 57.6 cu. yds., @ \$1.8125	\$104.41	\$0.1954
Sand, 28.4 cu. yds., @ \$1.885	53.53	0.1002
Portland Cement, 60 bbls., @ \$1.30	78.00	0.1460
Labor	126.04	0.2359
534.3 square yards @ \$0.6775	\$361.97	\$0.6775

Concrete Curb**Materials:**

Crushed Pebbles, 8.1 cu. yds., @ \$1.8125	\$14.68	\$0.0275
Sand, 4.2 cu. yds., @ \$1.885	7.92	0.0148
Portland Cement, 8.75 bbls., @ \$1.30	11.38	0.0213
Forms, etc., 250 ft. B. M., @ \$28.00	7.00	0.0131
Labor	18.67	0.0349
534.3 square yards @ \$0.1116	\$59.65	\$0.1116

Sand Cushion**Materials:**

Sand, 29.6 cu. yds., @ \$1.885	\$55.80	\$0.1044
Labor	12.09	0.0226
534.3 square yards @ \$0.1270	\$67.89	\$0.1270

Vitrified Blocks**Materials:**

Vitrified Blocks, 22482, @ \$29.85 per M.	\$671.09	\$1.2560
534.3 square yards @ \$1.2650		

Laying Vitrified Blocks**Labor:**

Laying and Rolling	\$23.81	\$0.0446
534.3 square yards @ \$0.0446		

Grouting and Covering**Materials:**

	Per Sq. Yd.	
Portland Cement, 15 bbls., @ \$1.30	\$19.50	\$0.0365
Sand, 9.4 cu. yds., @ \$1.885	17.72	0.0332
Labor	14.87	0.0278
534.3 square yards @ \$0.0975	\$52.09	\$0.0975

Trimming Shoulders**Materials:**

Cinders, 5.5 tons, @ \$1.25	\$6.88	\$0.0129
Labor	80.78	0.1512
534.3 square yards @ \$0.1641	\$87.66	\$0.1641

Service Test Road

Byberry and Bensalem Turnpike

Section Sixteen

Station 121 + 00 to 127 + 00

Bituminous Pavement, Penetration Method

Ugite Binder

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, 1½-inch trap rock was spread and rolled to bring the surface to a grade three inches below the finished grade. Screenings were then added and the road rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Wearing Surface:

Three inches of 1½-inch trap rock was spread upon the foundation course and rolled. One and six-tenths gallons per square yard of Ugite Binder No. 3, heated in tar kettles to a temperature of 250 degrees, was then applied by hand and covered with clean ¾-inch trap rock chips and rolled with a twelve-ton three-wheel roller.

Seal Coat:

A seal coat of six-tenths of a gallon per square yard of Ugite No. 3 was applied by hand at a temperature of 250 degrees and covered with clean ½-inch trap rock chips and rolled.

Cost Per Square Yard

Preparation of Foundation Course	\$0.1400
Wearing Surface	0.5042
Seal Coat	0.1762
Trimming Shoulders	0.0662
	\$0.8866

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 35.3 cu. yds., @ \$2.6325	\$92.93	\$0.0847
Trap Rock Screenings, 54.3 cu. yds., @ \$2.6325	14.29	0.0130
Labor:		
Scarifying	10.21	\$0.0093
Shaping	6.54	0.0060
Spreading 1½-inch Trap Rock....	20.14	0.0184
Rolling and Watering	9.47	0.0086
1097 square yards @ \$0.1400	\$153.58	\$0.1400

Wearing Surface

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 91.4 cu. yds., @ \$2.6325	\$240.61	\$0.2193
¾-inch Trap Rock, 20.3 cu. yds., @ \$2.6325	53.44	0.0487
Ugite Binder, 1750 gallons, @ \$0.076	133.00	0.1212
Labor:		
Spreading 1½-inch Trap Rock....	\$35.11	\$0.0320
Rolling 1½-inch Trap Rock.....	22.38	0.0204
Heating Ugite Binder	25.96	0.0237
Applying Ugite Binder	13.54	0.0124
Spreading ¾-inch Chips	9.52	0.0087
Rolling ¾-inch Chips	19.57	0.0178
1097 square yards @ \$0.5042.	\$553.13	\$0.5042

Seal Coat

Materials:		
½-inch Trap Rock, 25.2 cu. yds., @ \$2.6325	\$66.34	\$0.0605
Ugite Binder, 650 gallons, @ \$0.076	49.40	0.0450
Labor:		
Heating Ugite Binder	\$8.90	\$0.0081
Applying Ugite Binder	6.07	0.0055
Spreading ½-inch Chips	10.75	0.0098
Rolling ½-inch Chips	51.84	0.0473
1097 square yards @ \$0.1762	\$193.30	\$0.1762

Trimming Shoulders

Labor:		
1097 square yards @ \$0.0662.....	\$72.60	\$0.0662

Service Test Road

Byberry and Bensalem Turnpike

Section Seventeen

Station 127 + 00 to 130 + 60

Bituminous Pavement, Penetration Method

Byerlite Asphalt

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, 1½-inch trap rock was spread and rolled to bring the surface to a grade three inches below the finished grade. Screenings were then added and the road rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Wearing Surface:

Three inches of 1½-inch trap rock was spread upon the foundation course and rolled. One and seven-tenths gallons per square yard of Byerlite Asphalt, heated in tar kettles to a temperature of 400 degrees, was then applied by hand and covered with clean ¾-inch trap rock chips and rolled with a twelve-ton three-wheel roller.

Seal Coat:

A Seal Coat of one-half gallon per square yard of Byerlite Asphalt was applied by hand at a temperature of 400 degrees and covered with clean ½-inch trap rock chips and rolled.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.1523
Wearing Surface	0.6827
Seal Coat	0.2183
Trimming Shoulders	0.0066
	\$1.0599

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Materials:	Per Sq. Yd.	
Trap Rock, 16.1 cu. yds., @ \$2.6325	\$42.38	\$0.0656
Trap Rock Screenings, 2.4 cu. yds., @ \$2.6325	6.32	0.0098
Labor:		
Scarifying	\$1.46	\$0.0023
Shaping	15.50	0.0239
Spreading Trap Rock	15.93	0.0246
Rolling and Watering.....	16.86	0.0261
	<hr/>	<hr/>
	\$98.45	\$0.1523

Wearing Surface

Materials:		
1½-inch Trap Rock, 53.9 cu. yds., @ \$2.6325	\$141.89	\$0.2195
¾-inch Trap Rock, 12 cu. yds., @ \$2.6325	31.59	0.0489
Byerlite Asphalt, 1077 gallons, @ \$0.1043	112.34	0.1738
Labor:		
Spreading 1½-inch Trap Rock....	\$39.17	\$0.0606
Rolling 1½-inch Trap Rock.....	47.91	0.0742
Heating Byerlite Asphalt	29.25	0.0453
Applying Byerlite Asphalt	13.41	0.0207
Spreading ¾-inch Chips	9.68	0.0150
Rolling ¾-inch Chips	15.97	0.0247
	<hr/>	<hr/>
646.3 square yards @ \$0.6827	\$441.21	\$0.6827

Seal Coat

Materials:		
1½-inch Trap Rock, 14.9 cu. yds., @ \$2.6325	\$39.22	\$0.0607
Byerlite Asphalt, 323 gallons, @ \$0.1043	33.69	0.0522
Labor:		
Heating Byerlite Asphalt	\$8.56	\$0.0132
Applying Byerlite Asphalt	5.45	0.0084
Spreading 1½-inch Chips	9.77	0.0151
Rolling 1½-inch Chips.....	44.38	0.0687
	<hr/>	<hr/>
646.3 square yards @ \$0.2183	\$141.07	\$0.2183

Trimming Shoulders

Labor	\$4.25	\$0.0066
646.3 square yards @ \$0.0066		

Service Test Road

Byberry and Bensalem Turnpike

Section Eighteen

Station 130 + 60 to 133 + 00

Vitrified Block Pavement on Four-Inch Concrete Base

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. The surface was graded to within nine and one-half inches of the finished grade and additional material was added where required. It was then thoroughly rolled.

Concrete Base and Vitrified Blocks:

A four-inch concrete base with concrete curbs, proportioned 1-3-6, was laid upon the prepared subgrade. The concrete was mixed by hand labor.

The sand cushion was spread, rolled and shaped with a template after laying, the vitrified blocks were rolled and grouted to within one-half inch of the surface with cement grout proportioned 1-1 and covered with sand.

Cost Per Square Yard:

Foundation Course	\$0.1912
Concrete Base	0.8758
Concrete Curb	0.1702
Sand Cushion	0.1425
Vitrified Blocks	1.1557
Laying Vitrified Blocks	0.1787
Grouting and Covering	0.1137
Trimming Shoulders	0.0392
	<hr/>
	\$2.8670
Concrete Base, per cu. yd.....	\$7.8801
Concrete Curb, per linear ft.....	0.1524
Concrete Curb, per cu. yd.....	9.8900

Detailed Cost Per Square Yard

Preparation of Foundation Course

Labor:		Per Sq. Yd.
Scarifying	\$32.08	\$0.0746
Shaping	50.14	0.1166
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430 square yards @ \$0.192..	\$82.22	\$0.1912

Concrete Base

Materials:	Per Sq. Yd.	
Crushed Pebbles, 46.35 cu. yds., @ \$1.9375	\$89.79	\$0.2089
Sand, 22.9 cu. yds., @ \$2.015.....	46.14	0.1073
Portland Cement, 48.25 bbls., @ \$1.71	82.42	0.1917
Forms, etc., 150 ft. B. M., @ \$32.00	4.80	0.0112
Labor:	153.41	0.3567
430 square yards, at \$0.8758..	\$376.56	\$0.8758

Concrete Curb

Materials:	Per Sq. Yd.	
Crushed Pebbles, 7.18 cu. yds., @ \$1.9375	\$13.91	\$0.0324
Sand, 3.6 cu. yds. @ \$2.015.....	7.25	0.0169
Portland Cement, 7.5 bbls. @ \$1.71	12.72	0.0296
Forms, etc., 300 ft. B. M., @ \$32.00	9.60	0.0223
Labor	29.71	0.0690
430 square yards, @ \$0.1702.	\$73.19	\$0.1702

Sand Cushion

Materials:		
Sand, 23.9 cu. yds. @ \$2.015.....	\$48.13	\$0.1119
Labor	13.16	0.0306
430 square yards, @ \$0.1425..	\$61.29	\$0.1425

Vitrified Blocks

Vitrified Blocks, 18402 @ \$27.00..	\$496.91	\$1.1557
430 square yards, @ \$1.1557		

Laying Vitrified Blocks

Labor laying and rolling	\$76.84	\$0.1787
430 square yards @ \$0.1787		

Grouting and Covering

Materials:		
Sand, 7.6 cu. yds. @ \$2.015.....	\$15.31	\$0.0356
Portland Cement, 11.75 bbls. @ \$1.71	20.09	0.0467
Labor	13.50	0.0314
430 square yards, @ \$0.1137.	\$48.90	\$0.1137

Trimming Shoulders

Labor	\$16.84	\$0.0392
430 square yards, @ \$0.0392		

Service Test Road

Byberry & Bensalem Turnpike.

Section Nineteen Station 133 + 00 to 139 + 00

Bituminous Pavement, Penetration Method

Tarvia "X"

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, 1½ inch trap rock was spread and rolled to bring the surface to a grade three inches below the finished grade. Screenings were then added and the road rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Wearing Surface:

Three inches of 1½ inch Trap Rock was spread upon the foundation course and rolled. One and one-half gallons per square yard of Tarvia "X," heated in tar kettles to a temperature of 230 degrees, was then applied by a pressure distributor and covered with clean ¾-inch trap rock chips and rolled with a twelve-ton three-wheel roller.

Seal Coat:

A seal coat of one-half gallon per square yard of Tarvia "X" was applied by a pressure distributor at a temperature of 225 degrees and covered with clean ½-inch trap rock chips and rolled.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.2787
Wearing Surface	0.5108
Seal Coat	0.2279
Trimming Shoulders	0.0403
	\$1.0577

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Materials:

1½-inch Trap Rock, 55 cu. yds. @ \$2.6325	\$144.78	\$0.1341
Trap Rock Screenings, 8.6 cu. yds. @ \$2.6325	22.63	0.0210

Labor:

Scarifying	\$31.65	\$0.0293
Shaping	27.46	0.0254
Spreading Trap Rock	41.90	0.0388
Rolling and Watering	32.50	0.0301

1079.75 sq. yds. @ \$0.2787...	\$300.92	\$0.2787
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Wearing Surface

Materials:

1½-inch Trap Rock, 90 cu. yds. @ \$2.6325	\$236.93	\$0.2194
¾-inch Trap Rock, 20 cu. yds. @ \$2.6325	52.65	0.0488
Tarvia "X," 1671 gallons @ \$0.085	142.03	0.1315

Labor:

Spreading 1½-inch Trap Rock...	\$39.13	\$0.0362
Rolling 1½-inch Trap Rock.....	38.72	0.0359
Heating Tarvia "X"	9.06	0.0084
Applying Tarvia "X"	13.45	0.0125
Spreading ¾-inch Chips	13.20	0.0122
Rolling ¾-inch Chips	6.42	0.0059

1079.75 sq. yds. @ \$0.5108 ..	\$551.59	\$0.5108
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Seal Coat

Materials:

½-inch Trap Rock, 24.8 cu. yds. @ \$2.6325	\$65.28	\$0.0605
Tarvia "X," 591 gallons @ \$0.085	50.23	0.0465

Labor:

Heating Tarvia "X"	\$6.26	\$0.0058
Applying Tarvia "X"	14.71	0.0136
Spreading ½-inch Chips	18.36	0.0170
Rolling ½-inch Chips	91.25	0.0845

1079.75 sq. yds. @ \$0.2279..	\$246.09	\$0.2279
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Trimming Shoulders

Labor	\$43.47	\$0.0403
1079.75 sq. yds. @ \$0.0403		

Service Test Road

Byberry and Bensalem Turnpike

Section Twenty

Station 139 + 00 to 145 + 00

Bituminous Pavement. Penetration Method

Texaco Road Asphalt Binder

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, 1½-inch trap rock was spread and rolled to bring the surface to a grade three inches below the finished grade. Screenings were then added and the road rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Wearing Surface:

Three inches of 1½-inch trap rock was spread upon the foundation course and rolled. One and eight-tenths gallons per square yard of Texaco Road Asphalt Binder, heated in tar kettles to a temperature of 350 degrees, was then applied by hand and covered with clean three-quarter-inch trap rock chips and rolled with a twelve-ton three-wheel roller.

Seal Coat:

A seal coat of six-tenths of a gallon per square yard of Texaco Asphalt Binder was applied by hand at a temperature of 350 degrees and covered with clean ½ inch trap rock chips and rolled.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.2678
Wearing Surface.....	0.5580
Seal Coat.....	0.1714
Trimming Shoulders.....	0.0182
	\$1.0154

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 61.8 cu. yds. @ \$2.6325.....	\$162.69	\$0.1339
Trap Rock Screenings, 9.5 cu. yds. @ \$2.6325.....	25.01	0.0205
Labor:		
Scarifying	\$28.52	\$0.0235
Shaping	44.44	0.0366
Spreading 1½-inch Trap Rock....	34.95	0.0288
Rolling and Watering.....	29.73	0.0245
1214.73 sq. yds. @ \$0.2678...	\$325.34	\$0.2678

Wearing Surface

Materials:		
1½-inch Trap Rock, 101.2 cu. yds. @ \$2.6325.....	\$266.41	\$0.2193
¾-inch Trap Rock, 22.5 cu. yds. @ \$2.6325	59.23	0.0488
Texaco Asphalt Binder, 2261 gal- lons @ \$.10525.....	237.97	0.1959
Labor:		
Spreading 1½-inch Trap Rock....	\$38.12	\$0.0314
Rolling 1½-inch Trap Rock.....	13.92	0.0114
Heating Texaco Asphalt Binder..	22.95	0.0189
Applying Texaco Asphalt Binder.	15.49	0.0128
Spreading ¾-inch chips.....	10.55	0.0087
Rolling ¾-inch chips.....	13.17	0.0108
1214.73 sq. yds. @ \$0.5580..	\$677.81	\$0.5580

Seal Coat

Materials:		
½-inch Trap Rock, 27.9 cu. yds. @ \$2.6325	\$73.44	\$0.0605
Texaco Asphalt Binder, 730 gals. @ \$.10525	76.83	0.0632
Labor:		
Heating Texaco Asphalt Binder..	\$8.33	\$0.0069
Applying Texaco Asphalt Binder.	5.60	0.0046
Spreading ½-inch chips.....	10.02	0.0082
Rolling ½-inch chips.....	33.99	0.0280
1214.73 sq. yds. @ \$0.1714...	\$208.21	\$0.1714

Trimming Shoulders

Labor:		
1214.73 square yards @ \$0.0182..	\$22.12	\$0.0182

Service Test Road

Byberry and Bensalem Turnpike

Section Twenty-one Station 145 + 00 to 151 + 00

Bituminous Macadam Penetration Method

Standard Binder B

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, 1½-inch trap rock was spread and rolled to bring the surface to a grade three inches below the finished grade. Screenings were then added and the road rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Wearing Surface:

Three inches of 1½-inch trap rock was spread upon the foundation course and rolled. One and one-half gallons per square yard of Standard Binder B, heated in tar kettles to a temperature of 350 degrees, was then applied by hand, and covered with clean ¾-inch trap rock chips and rolled with a twelve-ton three-wheel roller.

Seal Coat:

A seal coat of one-half gallon per square yard of Standard Binder B was applied by hand at a temperature of 350 degrees and covered with clean ½-inch trap rock chips and rolled.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.3961
Wearing Surface.....	0.4861
Seal Coat.....	0.1442
Trimming Shoulders.....	0.0516
	\$1.0780

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 68.4 cu. yds. @ \$2.6325.....	\$180.06	\$0.1658
Trap Rock Screenings, 10.5 cu. yds. @ \$2.6325.....	27.64	0.0255
Labor:		
Scarifying	\$49.38	\$0.0455
Shaping	102.64	0.0945
Spreading 1½-inch Trap Rock....	34.63	0.0319
Rolling and Watering.....	35.77	0.0329
1085.84 sq. yds. @ \$0.3961...	\$430.12	\$0.3961

Wearing Surface

Materials:		
1½-inch Trap Rock, 90.5 cu. yds. @ \$2.6325.....	\$238.24	\$0.2194
¾-inch Trap Rock, 20.1 cu. yds. @ \$2.6325.....	52.91	0.0487
Standard Binder B, 1630 gallons @ \$.0905	147.53	0.1359
Labor:		
Spreading 1½-inch Trap Rock....	\$25.56	\$0.0235
Rolling 1½-inch Trap Rock.....	11.28	0.0104
Heating Standard Binder.....	17.80	0.0164
Applying Standard Binder.....	13.61	0.0125
Spreading ¾-inch Chips.....	9.64	0.0089
Rolling ¾-inch Chips.....	11.26	0.0104
1085.84 sq. yds. @ \$0.4861...	\$527.83	\$0.4861

Seal Coats

Materials:		
½-inch Trap Rock, 24.9 cu. yds. @ \$2.6325	\$65.55	\$0.0604
Standard Binder B, 568 gallons @ \$0.0905	51.42	0.0474
Labor:		
Heating Standard Binder	\$7.11	\$0.0065
Applying Standard Binder	4.93	0.0045
Spreading ½-inch Chips	7.59	0.0070
Rolling ½-inch Chips	19.95	0.0184
1085.84 sq. yds. @ \$0.1442..	\$156.55	\$0.1442

Trimming Shoulders

Labor	\$56.06	\$0.0516
1085.84 sq. yds. @ \$0.0516		

Service Test Road

Byberry and Bensalem Turnpike
Section Twenty-two Station 151 + 00 to 157 + 00
Bituminous Pavement, Penetration Method
Pioneer Road Asphalt

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, 1½-inch trap rock was spread and rolled to bring the surface to a grade three inches below the finished grade. Screenings were then added and the road rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Wearing Surface:

Three inches of 1½-inch trap rock was spread upon the foundation course and rolled. One and seven-tenths gallons per square yard of Pioneer Road Asphalt No. 963, heated in tar kettles to a temperature of 350 degrees, was then applied by hand and covered with clean ¾-inch trap rock chips and rolled with a twelve-ton three-wheel roller.

Seal Coat:

A seal coat of one-half gallon per square yard of Pioneer Road Asphalt No. 963 was applied at a temperature of 350 degrees and covered with clean ½-inch trap rock chips and rolled.

Cost Per Square Yard

Preparation of Foundation Course	\$0.4549
Wearing Surface	0.5475
Seal Coat	0.1671
Trimming Shoulders	0.0455
	\$1.2150

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 80.5 cu. yds., @ \$2.6325	\$211.92	\$0.1976
Trap Rock Screenings, 12.4 cu. yds., @ \$2.6325	32.64	0.0304
Labor:		
Scarifying	\$31.40	\$0.0293
Shaping	131.42	0.1225
Spreading Trap Rock	38.32	0.0357
Rolling and Watering	42.20	0.0394
1072.44 sq. yds., @ \$0.4549..	\$487.90	\$0.4549

Wearing Surface

Materials:		
1½-inch Trap Rock, 89.4 cu. yds., @ \$2.6325	\$235.35	\$0.2195
¾-inch Trap Rock, 19.9 cu. yds., @ \$2.6325	52.39	0.0489
Pioneer Road Asphalt No. 963, 1823 gallons, @ \$.10584....	192.94	0.1799
Labor:		
Spreading 1½-inch Trap Rock ...	\$40.04	\$0.0373
Rolling 1½-inch Trap Rock	13.20	0.0123
Heating Pioneer Road Asphalt No. 963	21.80	0.0203
Applying Pioneer Road Asphalt No. 963	11.68	0.0109
Spreading ¾-inch Chips	8.77	0.0082
Rolling ¾-inch Chips	10.96	0.0102
1072.44 sq. yds., @ \$0.5475..	\$587.13	\$0.5475

Seal Coat

Materials:		
½-inch Trap Rock, 24.6 cu. yds., @ \$2.6325	\$64.76	\$0.0604
Pioneer Road Asphalt No. 963, 587 gallons, @ \$.10584	62.13	0.0579
Labor:		
Heating Pioneer Road Asphalt No. 963	\$8.78	\$0.0082
Applying Pioneer Road Asphalt No. 963	4.75	0.0044
Spreading ½-inch Chips	7.90	0.0074
Rolling ½-inch Chips	30.84	0.0288
1072.44 sq. yds., @ \$0.1671..	\$179.16	\$0.1671

Trimming Shoulders

Labor	\$48.83	\$0.0455
1072.44 sq. yds. @ \$0.0455		

Service Test Road

Byberry and Bensalem Turnpike

Section Twenty-three Station 157 + 00 to 163 + 00

Bituminous Pavement, Penetration Method

Bermudez Asphalt Binder

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base.

After cleaning and spiking the old macadam, 1½-inch trap rock was spread and rolled to bring the surface to a grade three inches below the finished grade. Screenings were then added and the road rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Wearing Surface:

Three inches of 1½-inch trap rock was spread upon the foundation course and rolled. One and eight-tenths gallons per square yard of Bermudez Asphalt Binder, heated in tar kettles to a temperature of 350 degrees, was then applied by hand and covered with clean ¾-inch trap rock chips and rolled with a twelve-ton three-wheel roller.

Seal Coat:

A seal coat of six-tenths gallons per square yard of Bermudez Asphalt Binder was applied by hand at a temperature of 350 degrees and covered with clean ½-inch trap rock chips and rolled.

Cost Per Square Yard

Preparation Foundation Course	\$0.3571
Wearing Surface	0.5932
Seal Coat	0.1835
Trimming Shoulders	0.0173
	\$1.1511

Detailed Cost Per Square Yard Preparation of Foundation Course

Materials:		Per Sq. Yd.
1½-inch Trap Rock, 93 cu. yds. @		
\$2.6325	\$244.82	\$0.2137
Trap Rock Screenings, 14.3 cu. yds.		
@ \$2.6325	37.70	0.0329

Labor:

Scarifying	\$35.71	\$0.0312
Shaping	25.27	0.0221
Spreading 1½-inch Trap Rock ...	41.98	0.0366
Rolling and Watering	23.57	0.0206
1145.43 sq. yds., @ \$0.3571..	\$409.05	\$0.3571

Wearing Surface**Materials:**

Per Sq. Yd.

1½-inch Trap Rock, 95.4 cu. yds., @ \$2.6325	\$251.14	\$0.2193
¾-inch Trap Rock, 21.2 cu. yds., @ \$2.6325	55.81	0.0487
Bermudez Asphalt Binder, 2099 gallons @ \$0.1275	267.62	0.2336

Labor:

Spreading 1½-inch Trap Rock ...	\$39.12	\$0.0342
Rolling 1½-inch Trap Rock	19.18	0.0167
Heating Bermudez Asphalt Binder	14.69	0.0128
Applying Bermudez Asphalt Binder	11.08	0.0097
Spreading ¾-inch Chips	8.91	0.0078
Rolling ¾-inch Chips	11.90	0.0104
1145.43 sq. yds., @ \$0.5932..	\$679.45	\$0.5932

Seal Coat**Materials:**

½-inch Trap Rock, 26.3 cu. yds. @ \$2.6325	\$69.24	\$0.0604
Bermudez Asphalt Binder, 687 gallons @ \$0.1275	87.59	0.0765

Labor:

Heating Bermudez Asphalt Binder	\$4.87	\$0.0043
Applying Bermudez Asphalt Binder	3.63	0.0032
Spreading ½-inch Chips	6.70	0.0050
Rolling ½-inch Chips	38.19	0.0333
1145.43 sq. yds., @ \$0.1835..	\$210.22	\$0.1835

Trimming Shoulders**Labor:**

	\$19.82	\$0.0173
1145.43 sq. yds., @ \$0.0173		

Service Test Road

Byberry and Bensalem Turnpike

Section Twenty-four Station 163 + 00 to 169 + 00

Bituminous Pavement, Penetration Method

Sun Hydrolene Asphalt

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. After cleaning and spiking the old macadam, 1½-inch trap rock was spread and rolled to bring the surface to a grade three inches below the finished grade. Screenings were then added and the road rolled and puddled until thoroughly cemented. A twelve-ton three-wheel roller was used.

Wearing Surface:

Three inches of 1½-inch trap rock was spread upon the foundation course and rolled. One and seven-tenths gallons per square yard of Sun Hydrolene Asphalt Binder, heated in tar kettles to a temperature of 350 degrees, was then applied by hand and covered with clean ¾-inch trap rock chips and rolled with a twelve-ton three-wheel roller.

Seal Coat:

A seal coat of one-half gallon per square yard of Sun Hydrolene Asphalt Binder was applied by hand at a temperature of 350 degrees, covered with clean ½-inch trap rock chips and rolled.

Cost Per Square Yard

Preparation of Foundation Course	\$0.5419
Wearing Surface	0.5383
Seal Coat	0.1608
Trimming Shoulders	0.0587
	\$1.2997

Detailed Cost Per Square Yard Preparation of Foundation Course

Materials:	Per Sq. Yd.	
1½-inch Trap Rock, 117.5 cu. yds., @ \$2.6325	\$309.32	\$0.2884
Trap Rock Screenings, 18.1 cu. yds., @ \$2.6325	47.64	0.0444

Labor:

Scarifying	\$70.61	\$0.0658
Shaping	5.31	0.0050
Spreading Trap Rock	89.21	0.0832
Rolling and Watering	59.12	0.0551
1072.4 sq. yds., @ \$0.5419..	\$581.21	\$0.5419

Wearing Surface**Materials:**

1½-inch Trap Rock, 89.4 cu. yds., @ \$2.6325	\$235.34	\$0.2194
¾-inch Trap Rock, 19.9 cu. yds., @ \$2.6325	52.39	0.0489
Sun Hydrolene Asphalt Binder, 1811 gallons @ \$0.0886	160.46	0.1496

Labor:

Spreading 1½-inch Trap Rock ...	\$50.15	\$0.0467
Rolling 1½-inch Trap Rock	3.40	0.0032
Heating Sun Hydrolene Asphalt Binder	28.53	0.0266
Applying Sun Hydrolene Asphalt Binder	13.83	0.0129
Spreading ¾-inch Chips	11.14	0.0104
Rolling ¾-inch Chips	22.08	0.0206
1072.4 sq. yds., @ \$0.5383...	\$577.32	\$0.5383

Seal Coat**Materials:**

½-inch Trap Rock, 24.6 sq. yds., @ \$2.6325	\$64.77	\$0.0604
Sun Hydrolene Asphalt Binder, 535 gallons @ \$0.0886	47.41	0.0442

Labor:

Heating Sun Hydrolene Asphalt Binder	\$7.97	\$0.0074
Applying Sun Hydrolene Asphalt Binder	4.80	0.0045
Spreading ½-inch Chips	7.47	0.0069
Rolling ½-inch Chips	40.07	0.0374
1072.4 sq. yds. @ \$0.1608..	\$172.49	\$0.1608

Trimming Shoulders

Labor	\$62.94	\$0.0587
1072.4 sq. yds. @ \$0.0587		

Service Test Road

Byberry & Bensalem Turnpike

Section Twenty-five

Station 169 + 00 to 174 + 50

Bicomac Concrete Pavement

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. This was removed to a depth of five inches below the finished grade, and where the original surface was lower than this grade, the surface was loosened, and 1½-inch stone and screenings were spread and rolled to raise the surface to the grade required for the laying of the concrete base. A five-ton tandem roller was used.

Concrete Pavement and Bituminous Top:

The concrete pavement, four inches thick, and proportioned 1-3-6, was laid, and as soon as the concrete had settled, it was rolled with a hand roller weighing 700 pounds, and while still wet and in a plastic condition, was covered with a resilient concrete wearing surface one-inch thick after compression. The wearing surface, or bituminous top, was applied cold, and consisted of one part Portland cement, six parts clean sand, and twelve parts clean trap rock passing a 1½-inch screen, and containing not more than 25% of 1½-inch size stone, and 8% of Headley Good Roads Company No. 26, known as Bicomac, which was used in the proportion of 70% of Bicomac, and 30% of water. The mineral aggregate was thoroughly coated with the solution. The sand and cement were mixed together and added to the coated stone and the whole thoroughly saturated with the solution and laid and rolled with a five-ton tandem roller, as soon as the base had become hard enough to sustain the roller.

Cost Per Square Yard

Preparation of Foundation Course	\$0.1461
Concrete Pavement	0.9777
Bituminous Top	0.6515
Trimming Shoulders	0.0918
	\$1.8671

**Detailed Cost Per Square Yard
Preparation of Foundation Course**

Labor:

Scarifying	\$30.74	\$0.0306
Shaping	115.98	0.1155
1015 sq. yds., @ \$0.1461....	<u>\$146.72</u>	<u>\$0.1461</u>

Concrete Pavement

Material:

Per Sq. Yd.

Trap Rock, 109.39 cu. yds., @ \$2.4705	\$270.24	\$0.2690
Gravel, 54.13 cu. yds., @ \$1.82...	98.52	0.0981
Portland Cement, 113.25 bbls., @ \$1.65	186.86	0.1860
Coal, 6 tons, @ \$5.....	30.00	0.0299
Forms, etc., 750 ft. B. M., @ \$32.	24.00	0.0239
Labor	<u>372.41</u>	<u>0.3708</u>
1015 sq. yds., @ \$0.9777....	<u>\$982.03</u>	<u>\$0.9777</u>

Bituminous Top Bicomac

Materials:

Trap Rock, 26.32 cu. yds., @ \$2.4705	\$65.02	\$0.0647
Sand, 13.17 cu. yds., @ \$1.82....	23.97	0.0239
Portland Cement, 15 bbls., @ \$1.65	24.75	0.0246
Bicomac, 1653.37 gallons, @ \$0.10997	181.84	0.1810
Coal, 2 tons, @ \$5.....	10.00	0.0400
Forms, etc., 350 ft. B. M., @ \$32.	11.20	0.0112

Labor:

Mixing	\$239.38	\$0.2383
Applying	79.79	0.0794
Rolling	18.45	0.0184
1015 sq. yds., at \$0.6515....	<u>\$654.40</u>	<u>\$0.6515</u>

Trimming Shoulders

Labor	\$92.23	\$0.0918
1015 sq. yds. @ \$0.0918		

Service Test Road

Byberry and Bensalem Turnpike

Section Twenty-six Station 174 + 50 to 180 + 15
Vitrified Block Pavement on Four-Inch Concrete Base

Foundation Course:

The foundation course was originally old waterbound macadam with a telford base. The surface was graded to nine and one-half inches of the finished grade and additional material was supplied where needed and rolled.

Concrete Base and Vitrified Blocks:

A four-inch concrete base with concrete curb, proportioned 1-3-6, was laid upon the prepared subgrade. The concrete was mixed in a Foote Concrete Mixer and by hand labor.

The sand cushion was spread, rolled with an iron hand roller and shaped with a template. After laying, the vitrified blocks were rolled with a four-ton tandem roller, the joints were grouted to within one-half inch of the surface with cement grout, proportioned 1-1, and covered with sand.

Cost Per Square Yard

Preparation of Foundation Course.....	\$0.1038
Concrete Base	1.0806
Concrete Curb	0.1991
Sand Cushion	0.1335
Vitrified Blocks	0.9631
Laying Vitrified Blocks	0.1635
Grouting and Covering	0.1175
Trimming Shoulders	0.1223
	\$2.8834
Concrete Base, per cubic yard.....	\$9.829
Concrete Curb, per cubic yard.....	12.2290
Concrete Curb, per linear foot.....	0.1790

Detailed Cost Per Square Yard

Preparation of Foundation Course

Labor:		Per Sq. Yd.
Scarifying	\$27.91	\$0.0273
Shaping	77.46	0.0763
	\$105.37	\$0.1038

Concrete Base**Materials:**

Trap Rock, 109.39 cu. yds., @ \$2.4705	\$270.24	\$0.2662
Sand, 53.56 cu. yds., @ \$1.82....	97.48	0.0960
Portland Cement, 112.25 bbls., @ \$1.65	185.21	0.1825
Forms, etc., 500 ft. B. M., @ \$32	16.00	0.0158
Coal, 5 tons, @ \$5.....	25.00	0.0246
Labor	502.89	0.4955
1004.4 sq. yds., @ \$1.0806...	\$1096.82	\$1.0806

Concrete Curb**Materials**

Trap Rock, 16.03 cu. yds., @ \$2.4705	\$39.59	\$0.0390
Sand, 7.93 cu. yds., @ \$1.82.....	14.43	0.0142
Portland Cement, 16.75 bbls., @ \$1.65	27.64	0.0272
Forms, etc., 750 ft. B. M., @ \$32..	24.00	0.0236
Labor	96.48	0.0951
1004.4 sq. yds., @ \$0.1991...	\$202.14	\$0.1991

Sand Cushion**Materials:**

Sand, 55.8 cu. yds., @ \$1.82.....	\$101.36	\$0.1001
Labor	33.92	0.0334
1001.4 sq. yds., @ \$0.1335...	\$135.48	\$0.1335

Vitrified Blocks**Materials:**

Vitrified Blocks, 39,473, @ \$24.654 per M.	\$977.51	\$0.9631
1004.4 sq. yds., @ \$0.9631.		

Laying Vitrified Blocks**Labor:**

Laying and Rolling.....	\$165.99	\$0.1635
1004.4 sq. yds., @ \$0.1635.		

Grouting and Covering**Materials:**

Portland Cement, 27.75 bbls., @ \$1.65	\$45.79	\$0.0456
Sand, 17.87 cu. yds., @ \$1.82....	32.52	0.0324
Forms, etc., 100 ft. B. M., @ \$32	3.20	0.0032
Labor	36.47	0.0363
1004.4 sq. yds., @ \$0.1175...	\$117.98	\$0.1175

Trimming Shoulders**Labor:**

	\$124.12	\$0.1223
1004.4 sq. yds., @ \$0.1223.		

Service Test Road

Byberry and Bensalem Turnpike

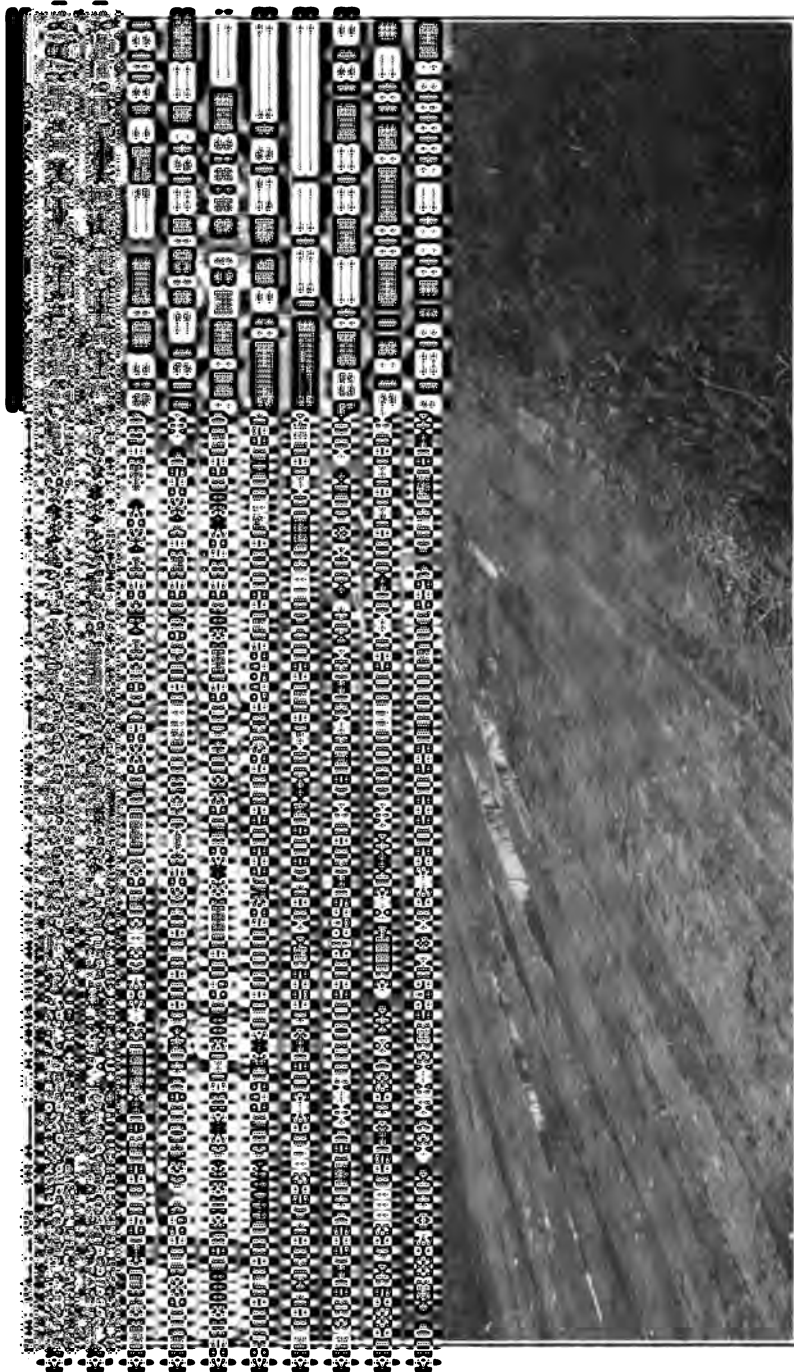
Schedule of Wages—1912		Per Day
Superintendents, \$125 per month.....	10 hours	\$4.81
Foremen	10 "	3.50
Carpenters	8 "	3.60
Roller Engineers	10 "	3.00
Paviors (straight time men)	10 "	2.50
Watchmen	12 "	1.75
Watchmen (after November 6, 1912) ..	12 "	2.00
Laborers	10 "	1.75
Laborers (after November 6, 1912) ..	10 "	2.00
Laborers (asphalt plant)	10 "	2.25
Single Teams	10 "	3.00
Double Teams	10 "	5.00
Double teams (after Nov. 6, 1912) ...	10 "	6.00

Schedule of Wages—1913

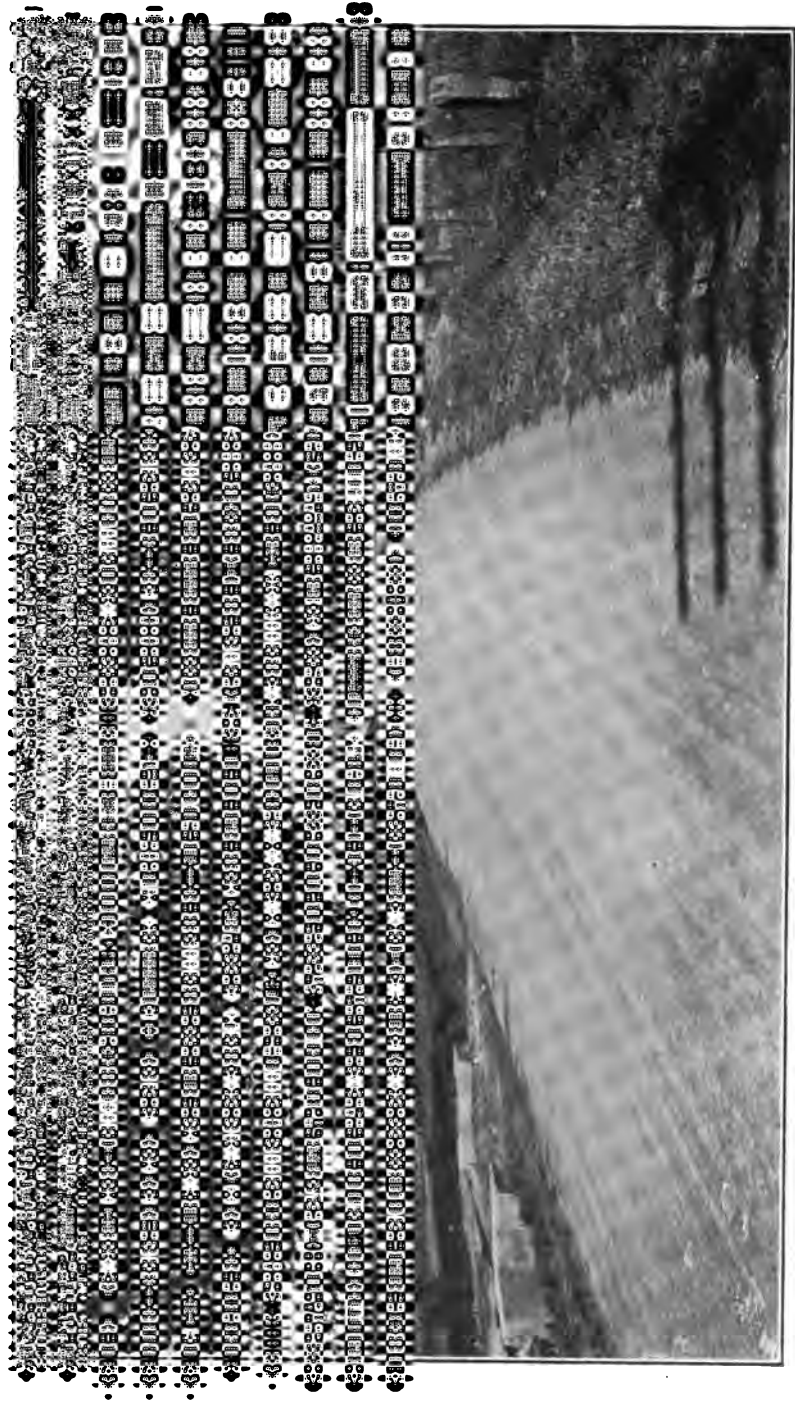
Foremen	10 hours	\$3.50
Foremen	9½ "	3.50
Foremen	10 "	3.00
Laborers	10 "	2.00
Laborers	9½ "	2.15
Laborers	9 "	2.00
Water Boys	9½ "	1.00
Single Teams	9½ "	3.00
Double Teams	9½ and 10 "	5.50
Paviors	8 "	4.50
Rammers	8 "	4.00

Schedule of Charges for Tools, etc.:

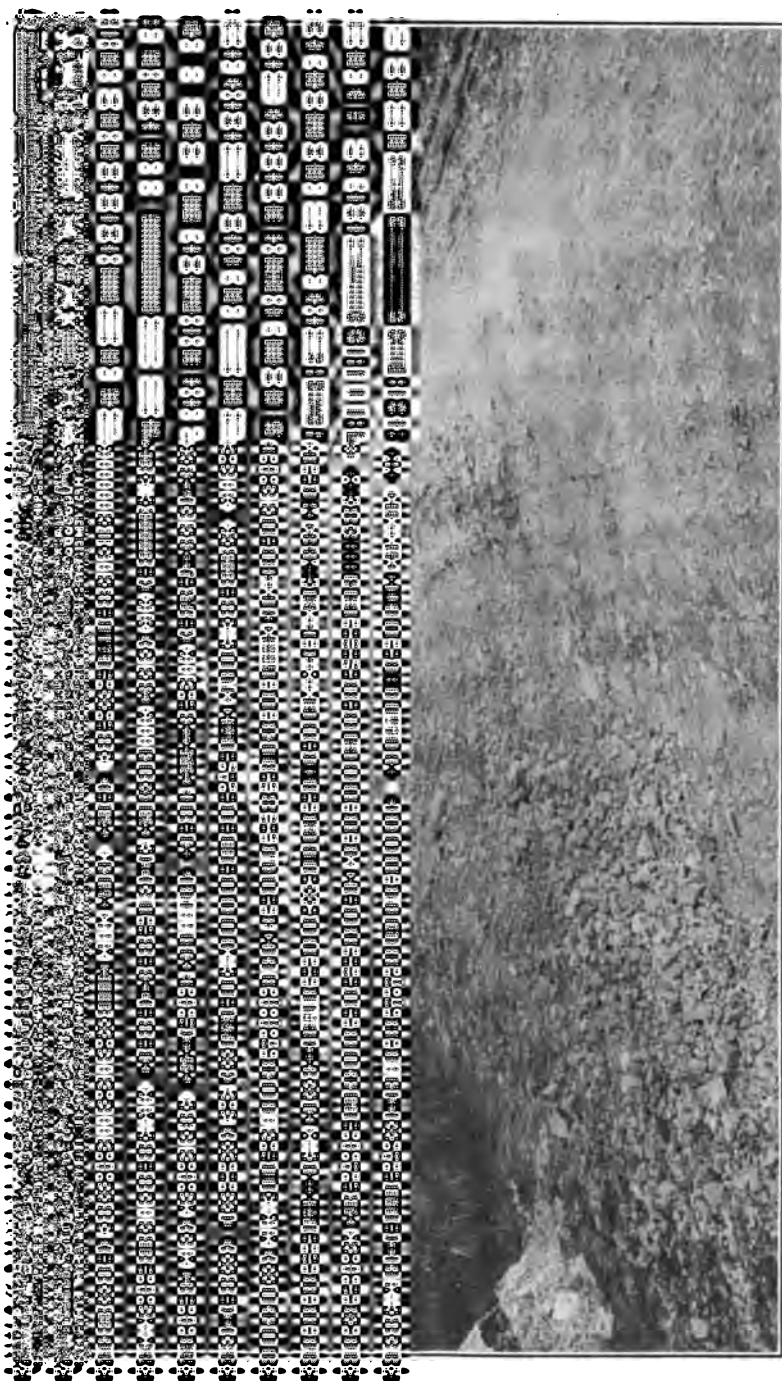
Rollers, twelve-ton, three-wheel, with engineer, etc.	\$12.00
Rollers, six-ton tandem, with engineer.....	8.00
Rollers, four-ton tandem, with engineer.....	10.00
Water Wagons50
Tar Kettles50
No allowance was made for the use of the Asphalt Plant on Mixing Sections.	



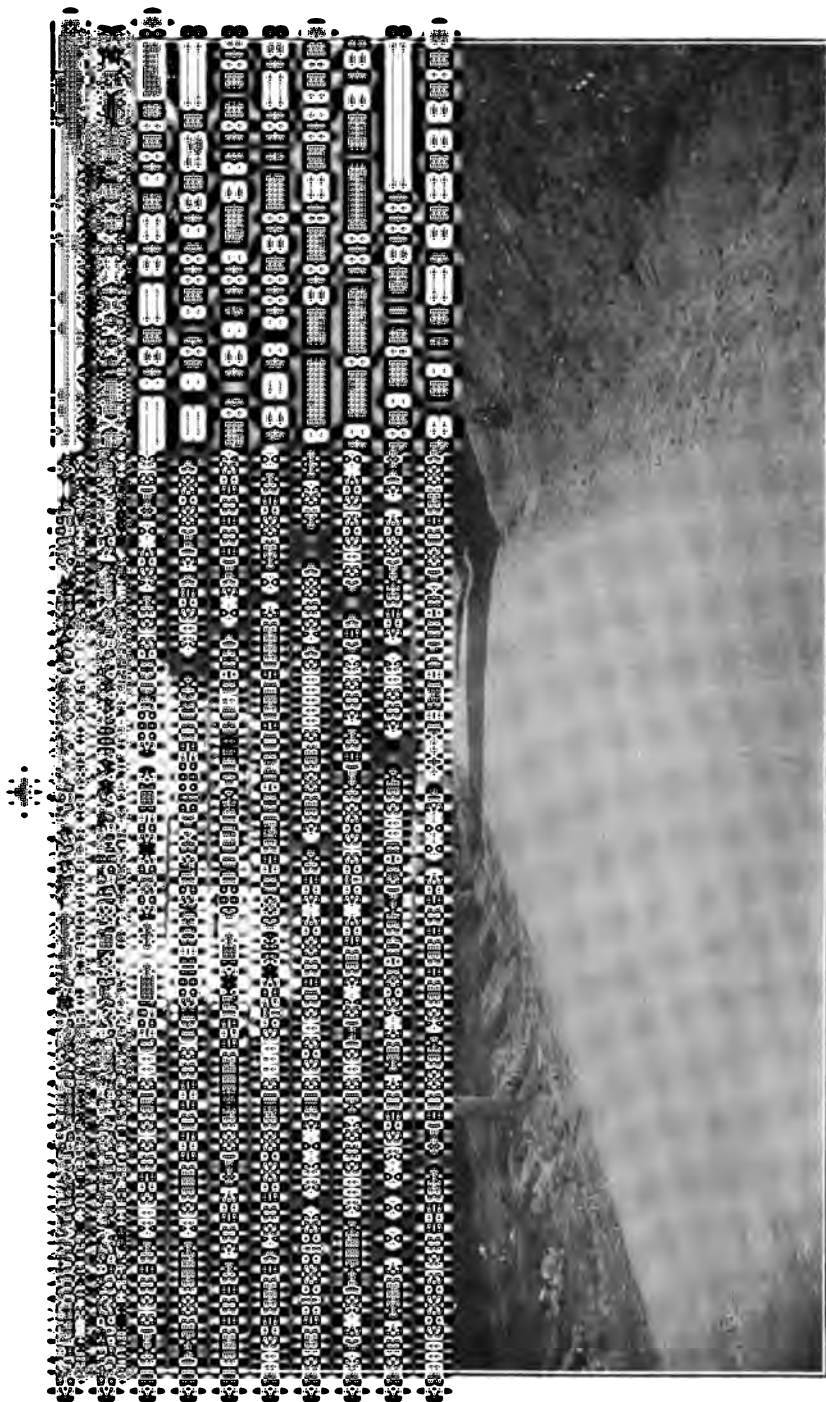
Typical View Before Construction



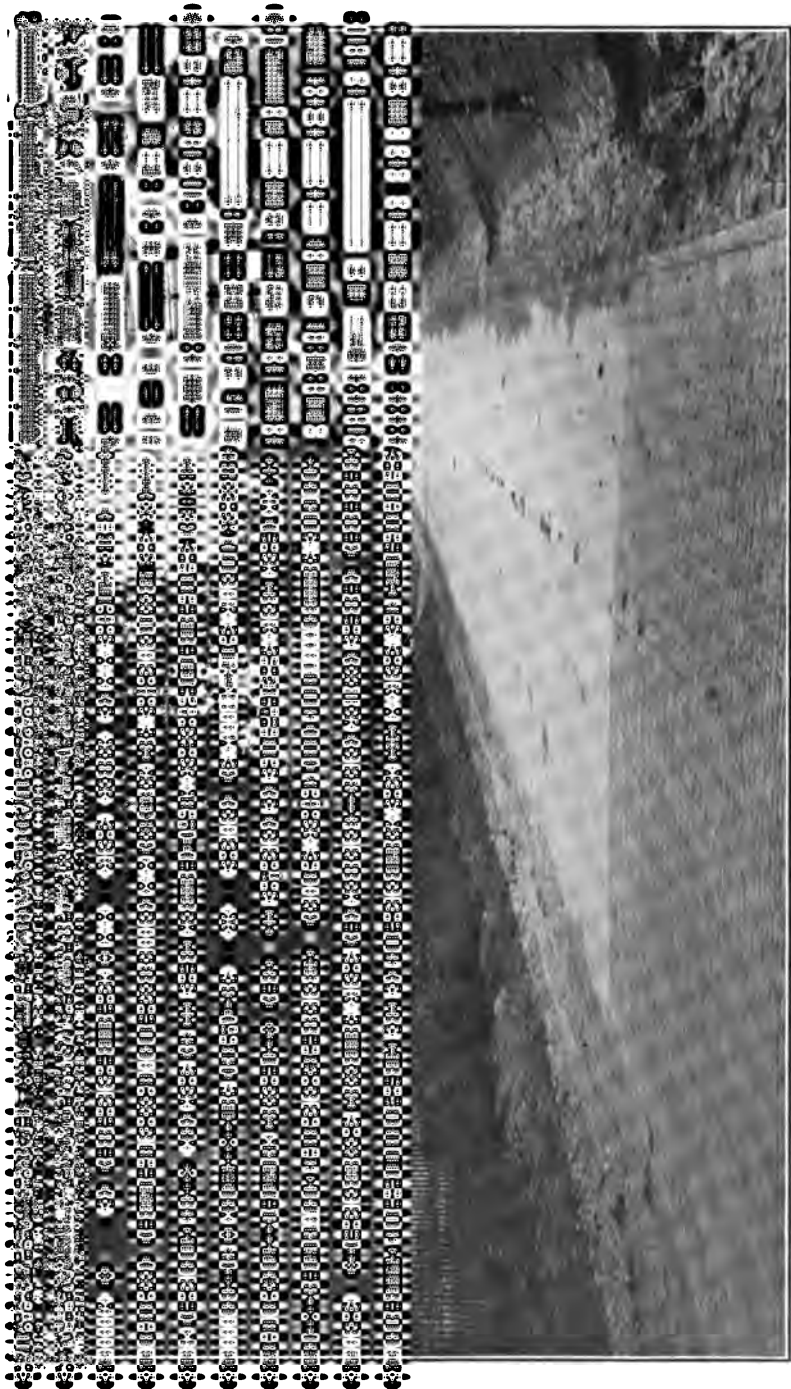
Typical View After Construction—Bituminous Pavement Penetration Method



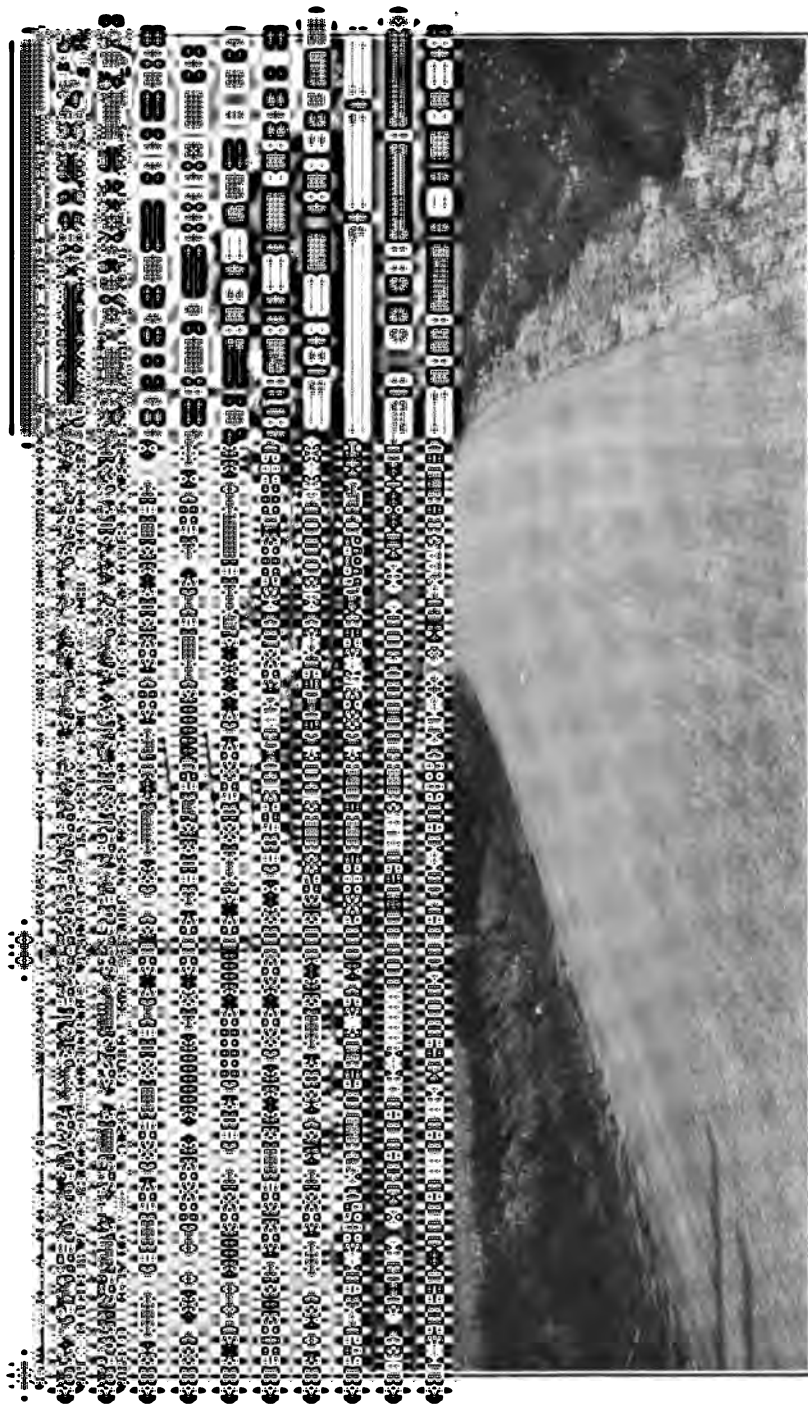
Typical View of Road Before Construction



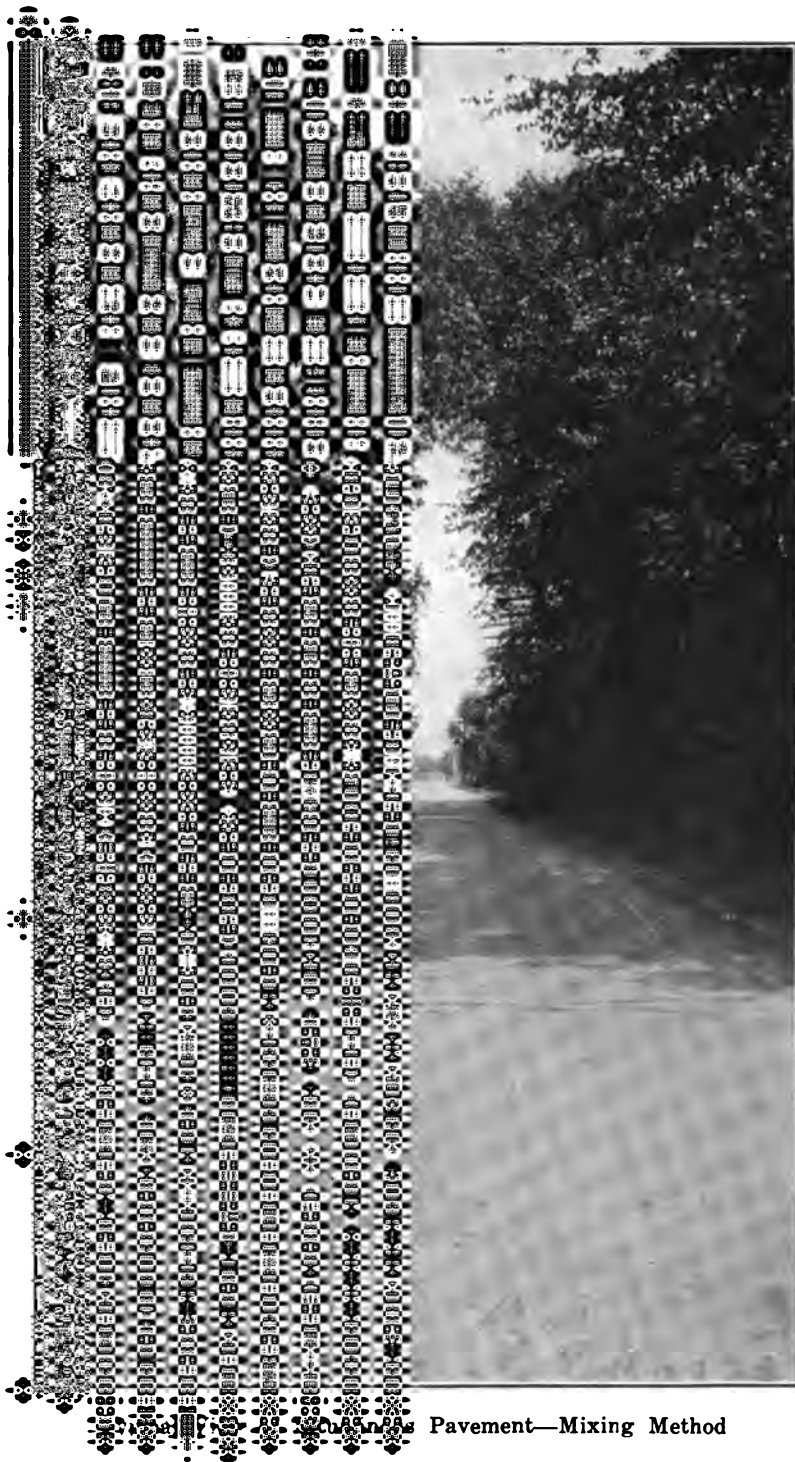
Typical View After Construction



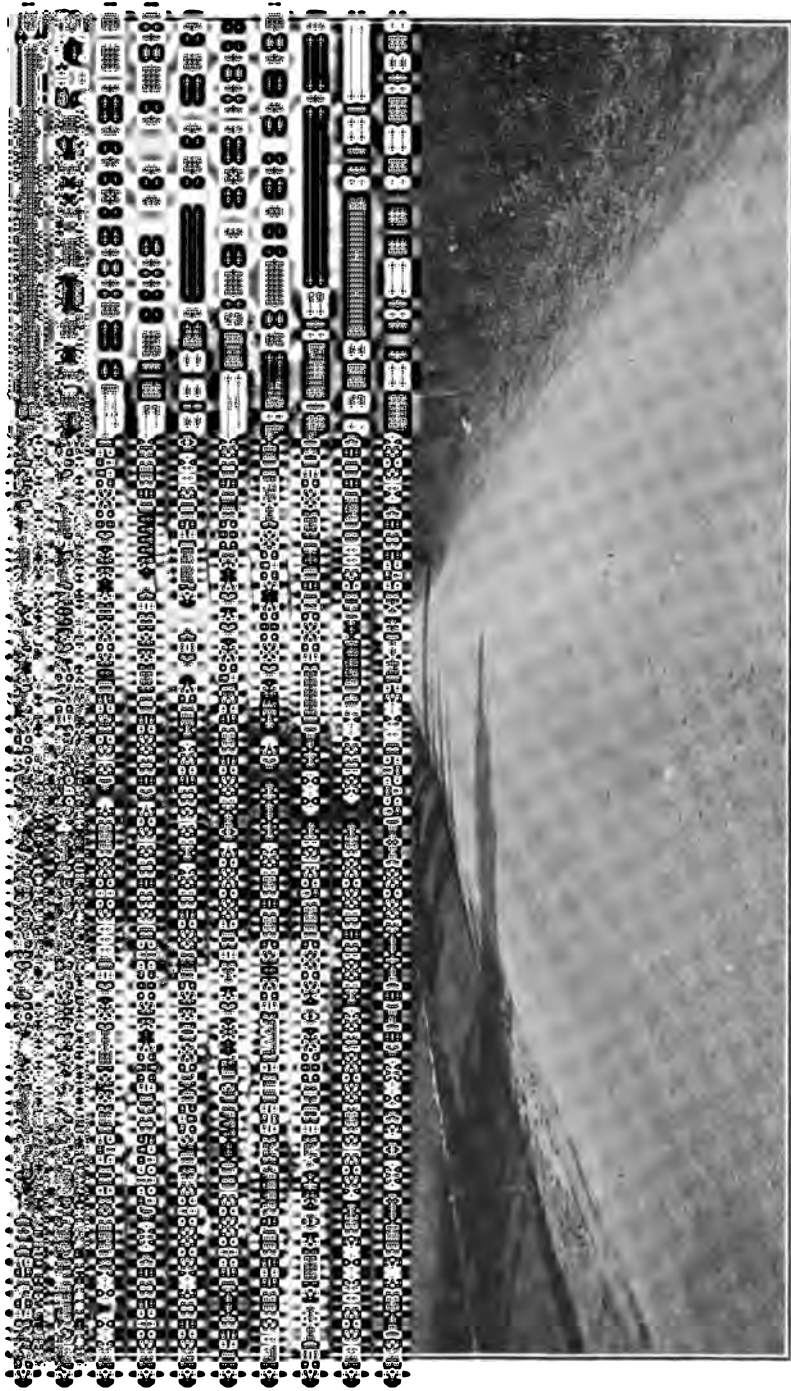
Typical View of Brick and Concrete Pavement and Rubble Gutters



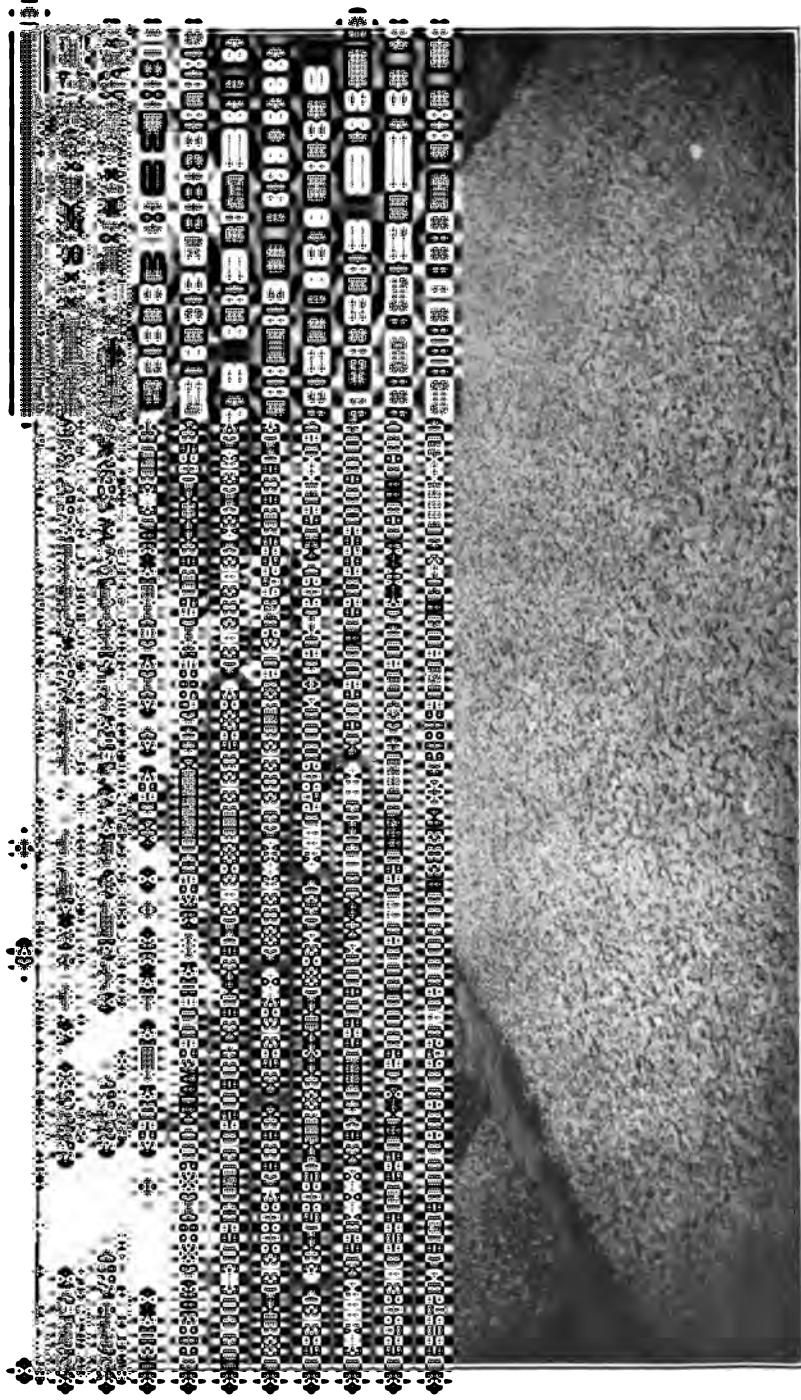
Typical View of Bituminous Pavement—Mixing Method



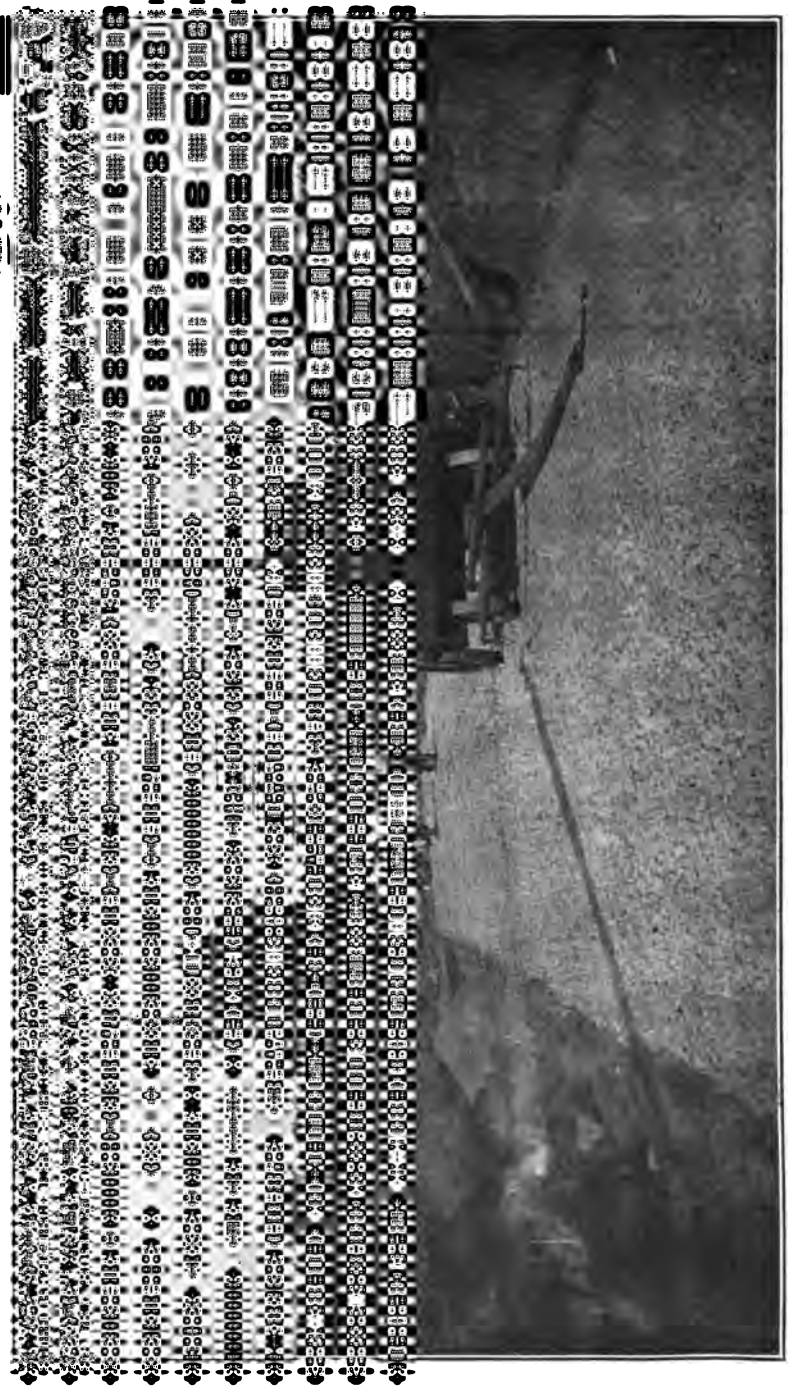
Pavement—Mixing Method



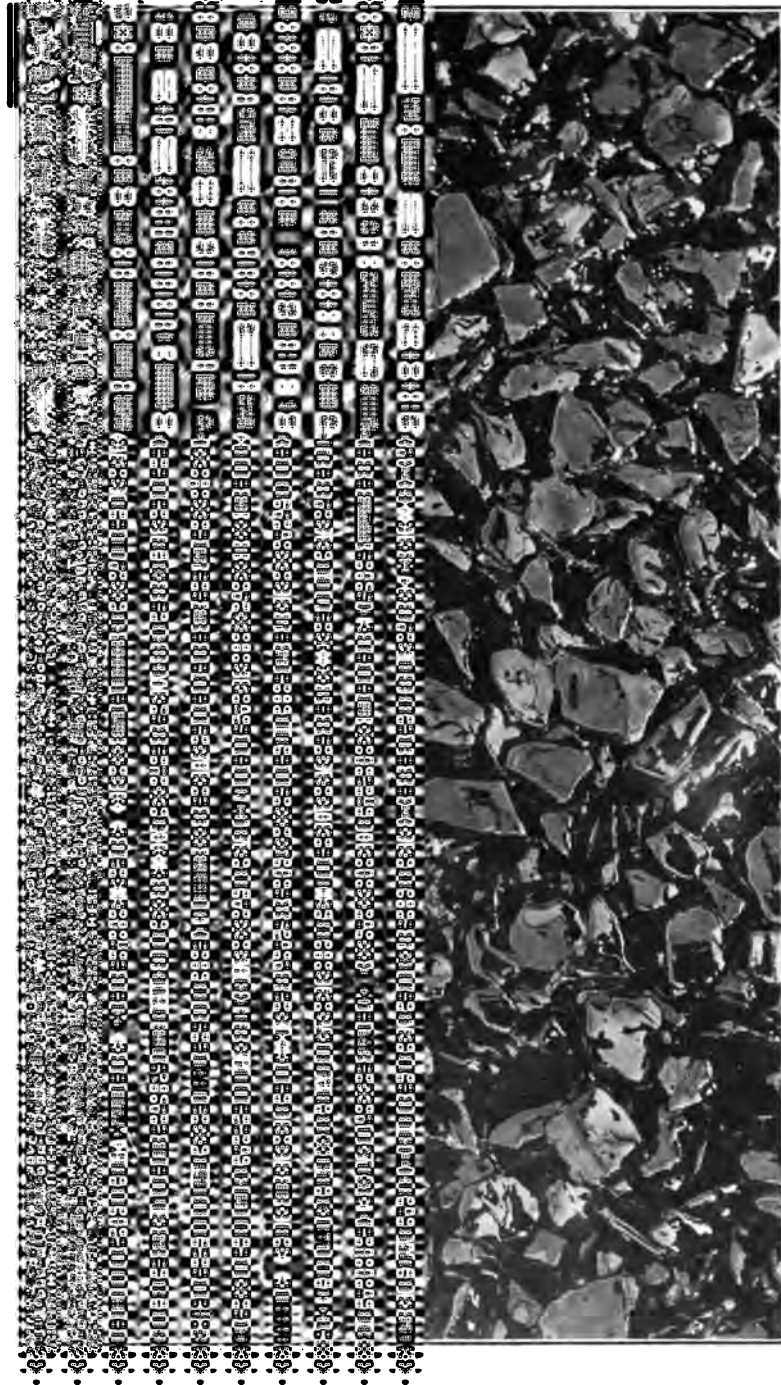
Typical View of Bituminous Pavement—Mixing Method



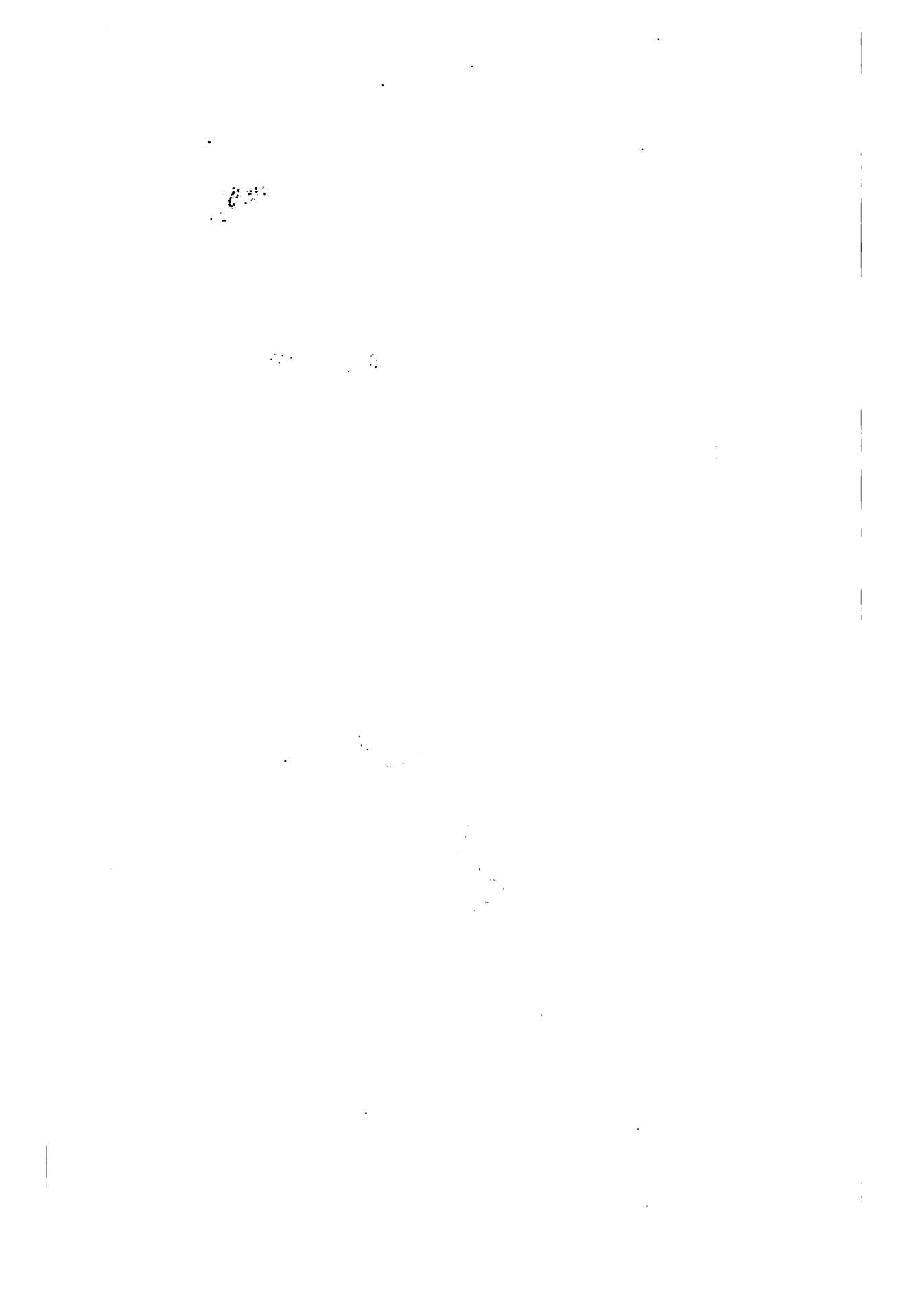
Typical View of Construction of Base Course

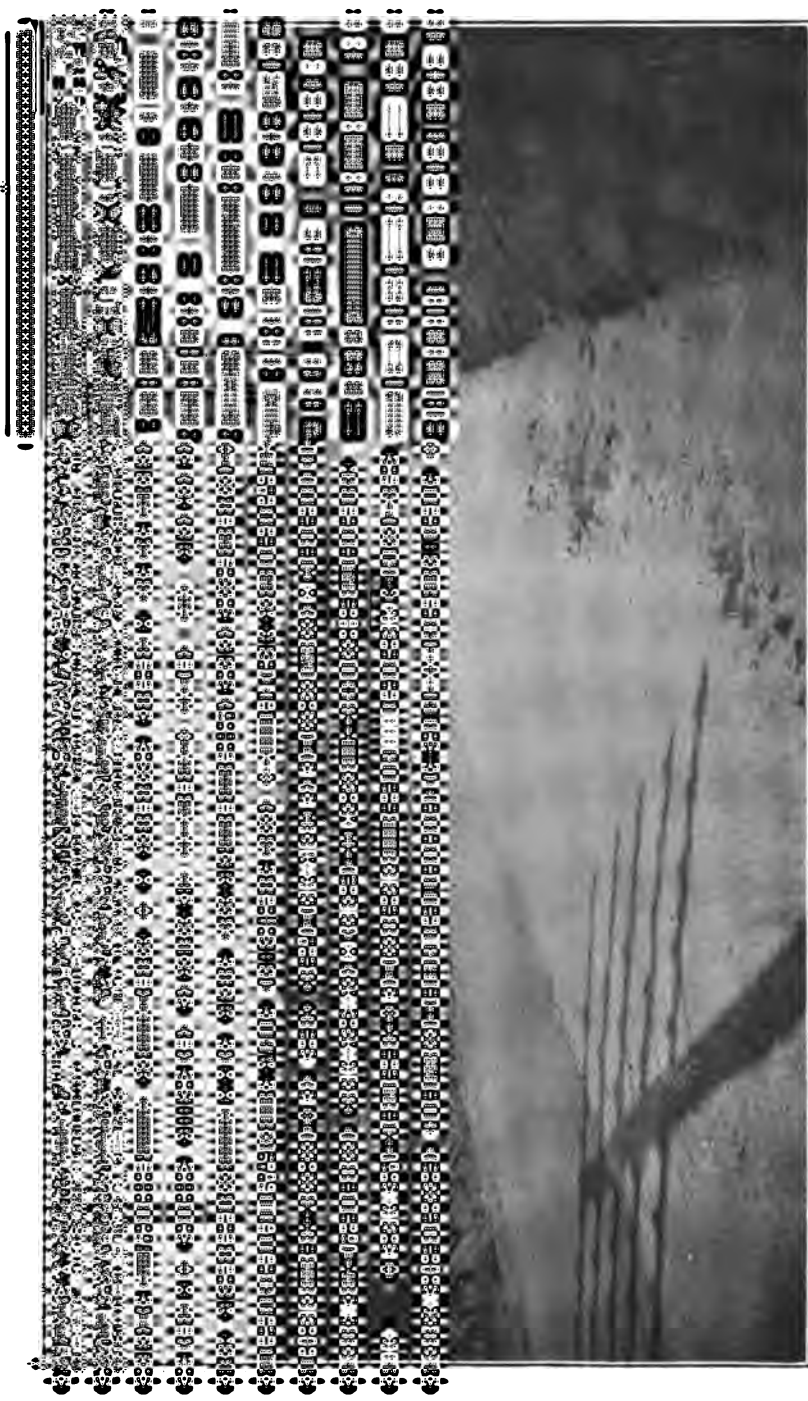


Typical View of Heating and Pouring Bituminous Materials

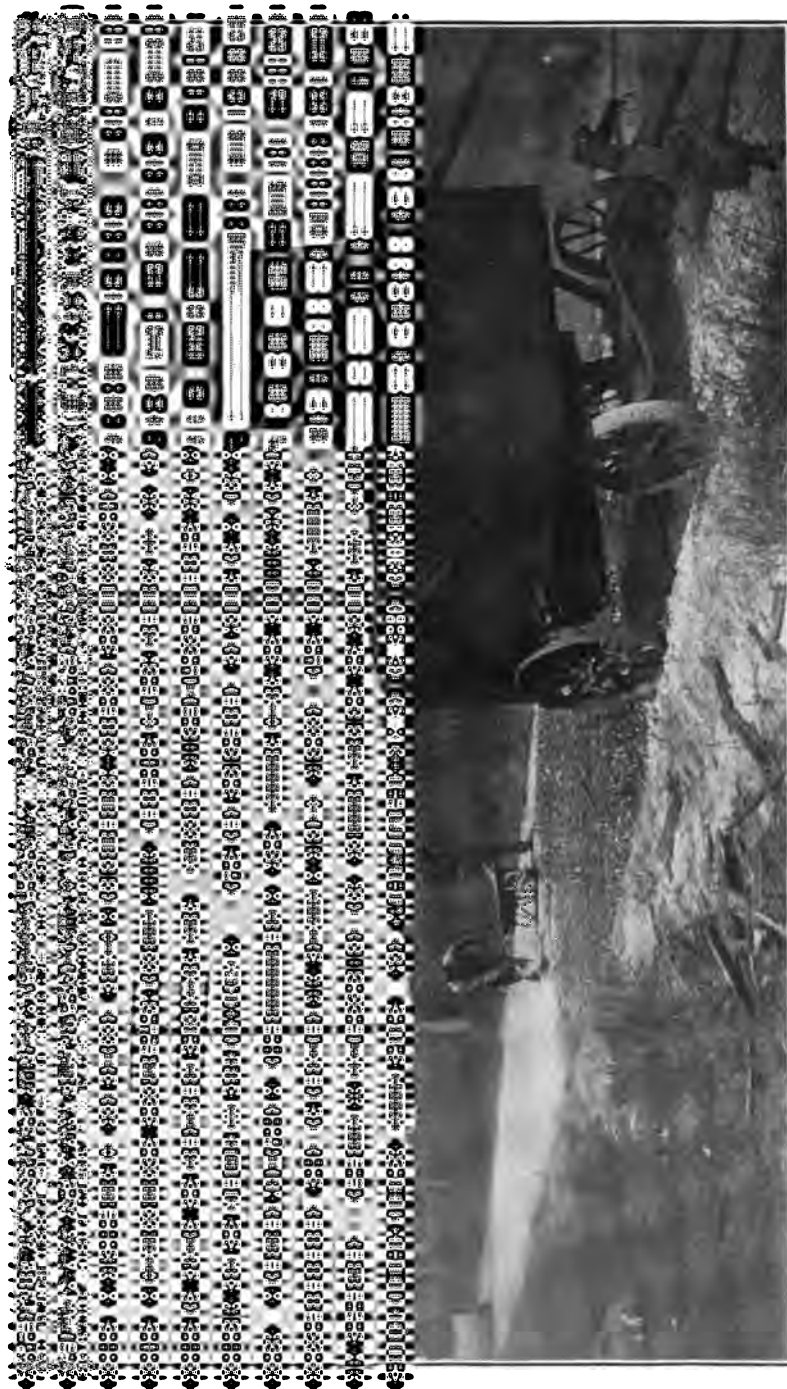


Typical View of Surface of Bituminous Pavement, Penetration Method, After First Application of Bituminous Material

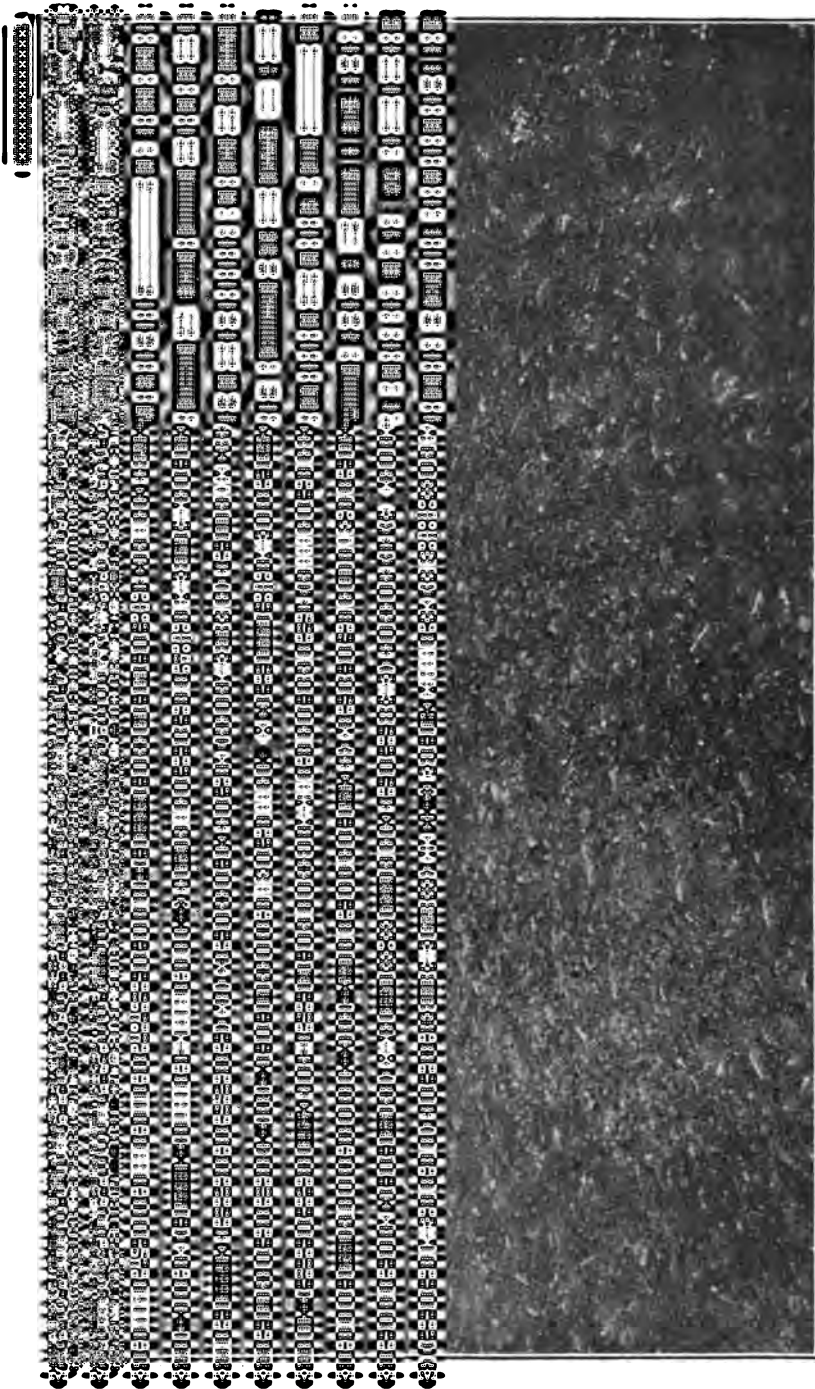




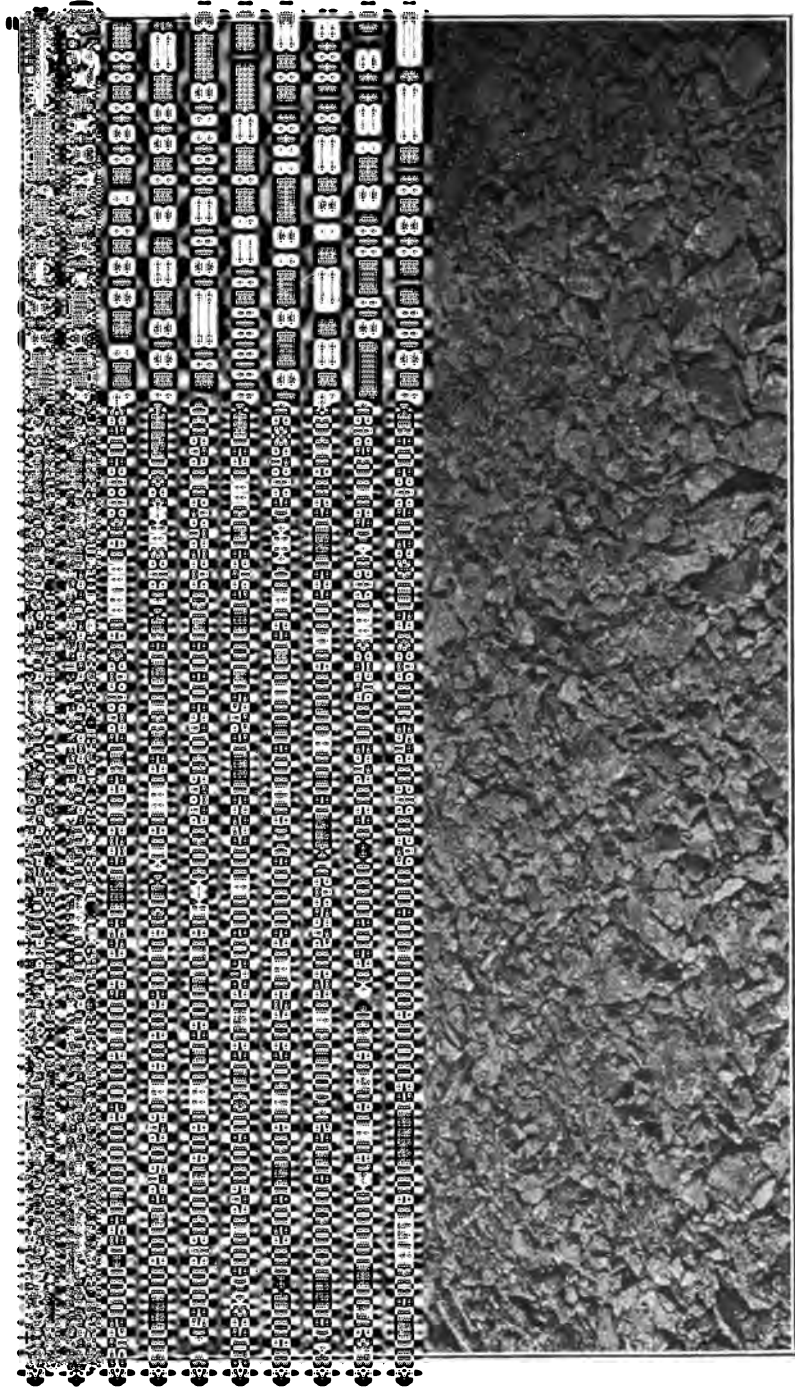
Typical View of Applying Seal Coat of Bituminous Material With Pressure Distributor



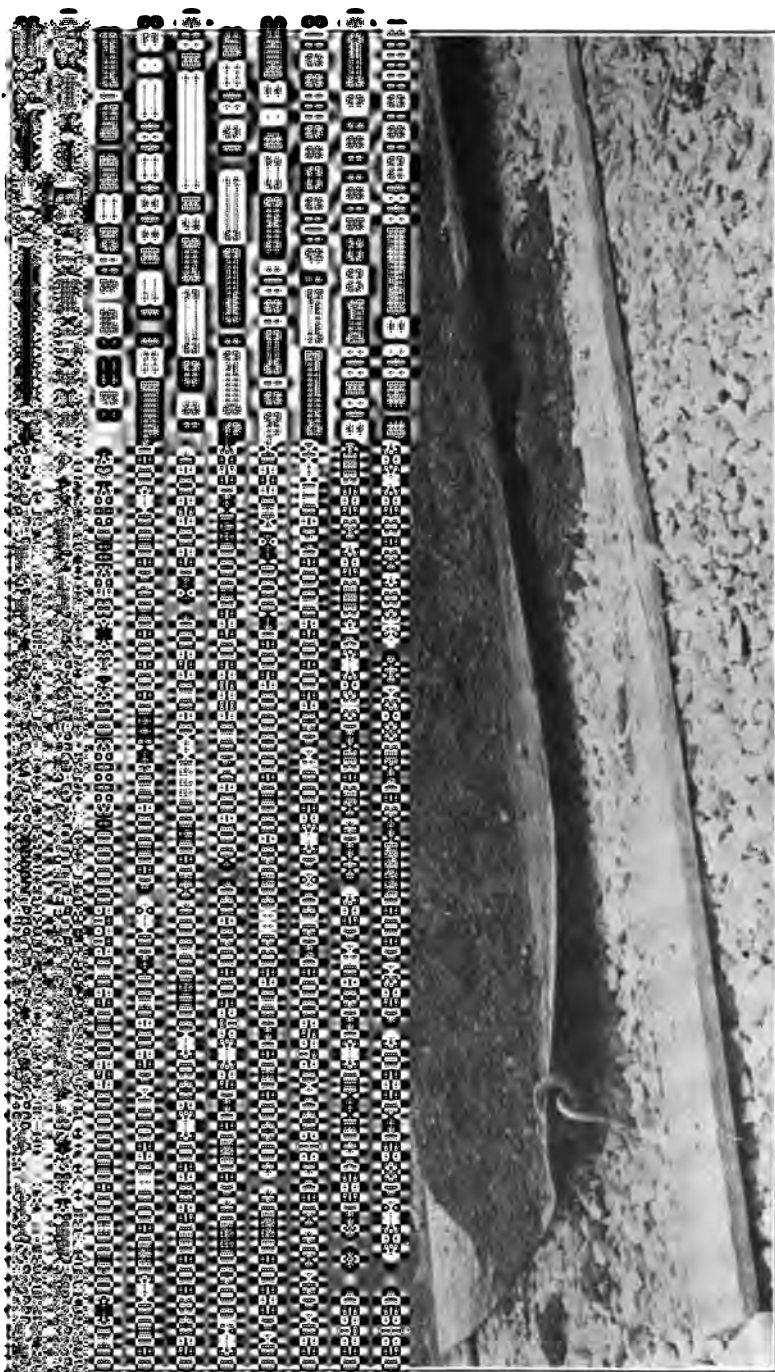
Typical View of Chipping and Rolling Seal Coat



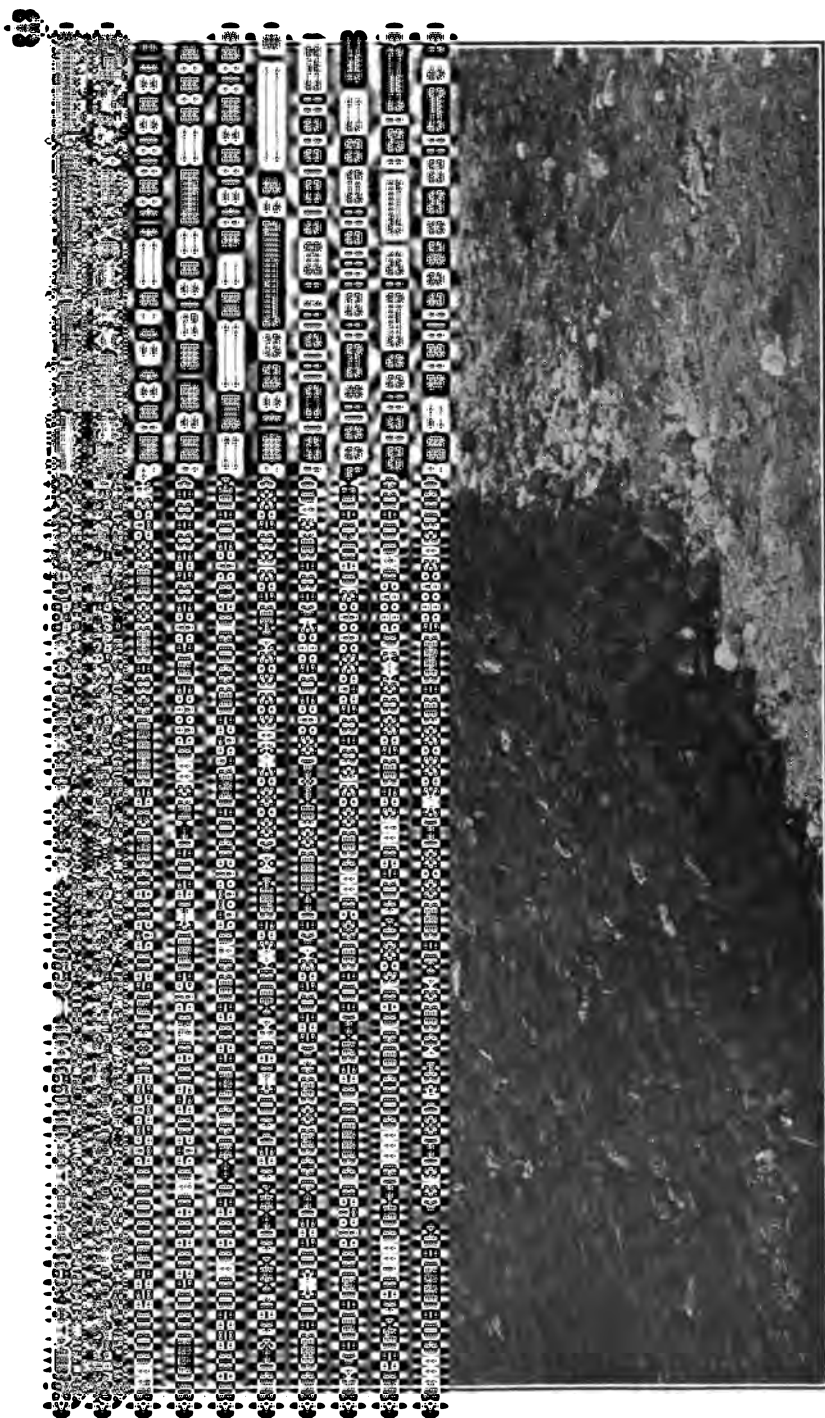
Typical View of Surface Bituminous Pavement, Penetration Method, After Applying Seal Coat, Chipping and Rolling



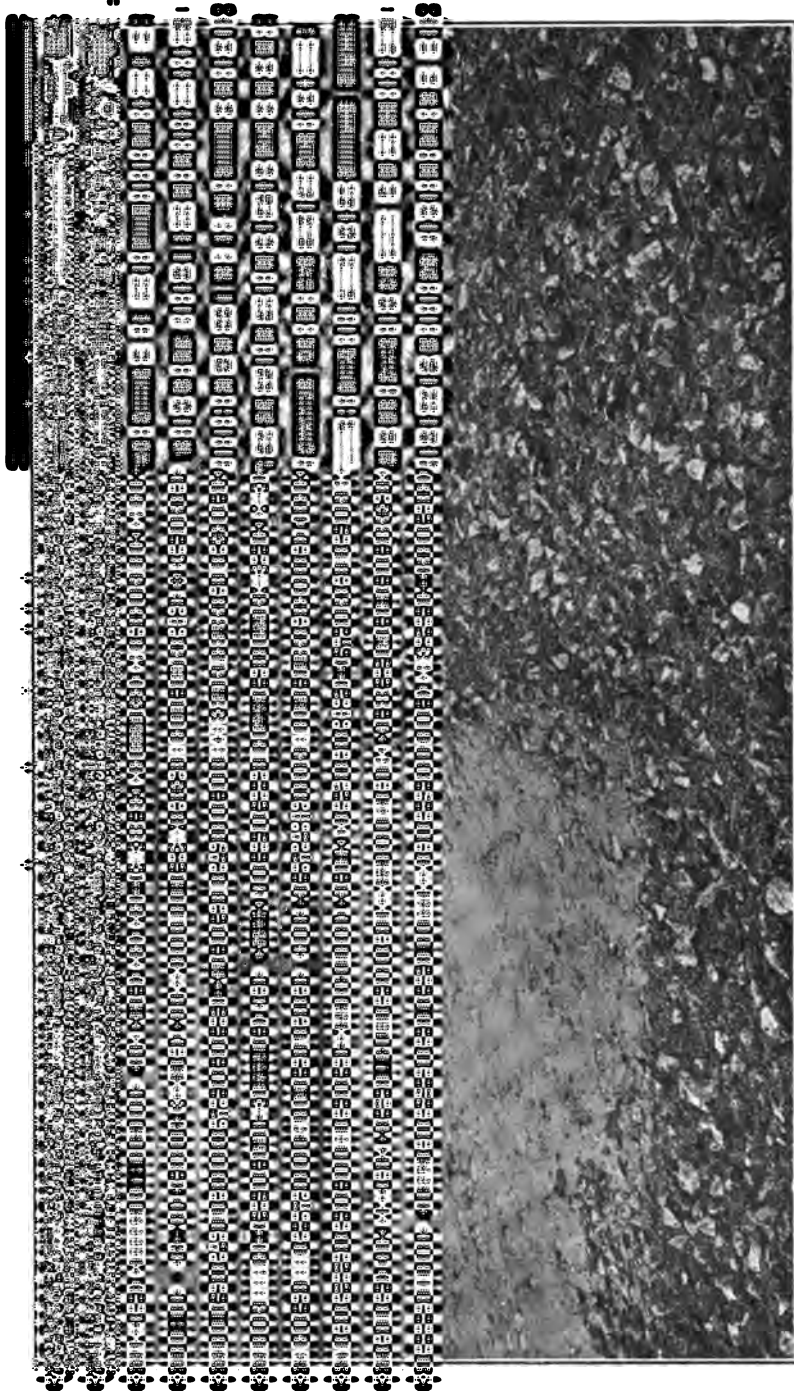
Typical View of Broken Stone Base for Foundation of Bituminous Pavement—Mixing Method



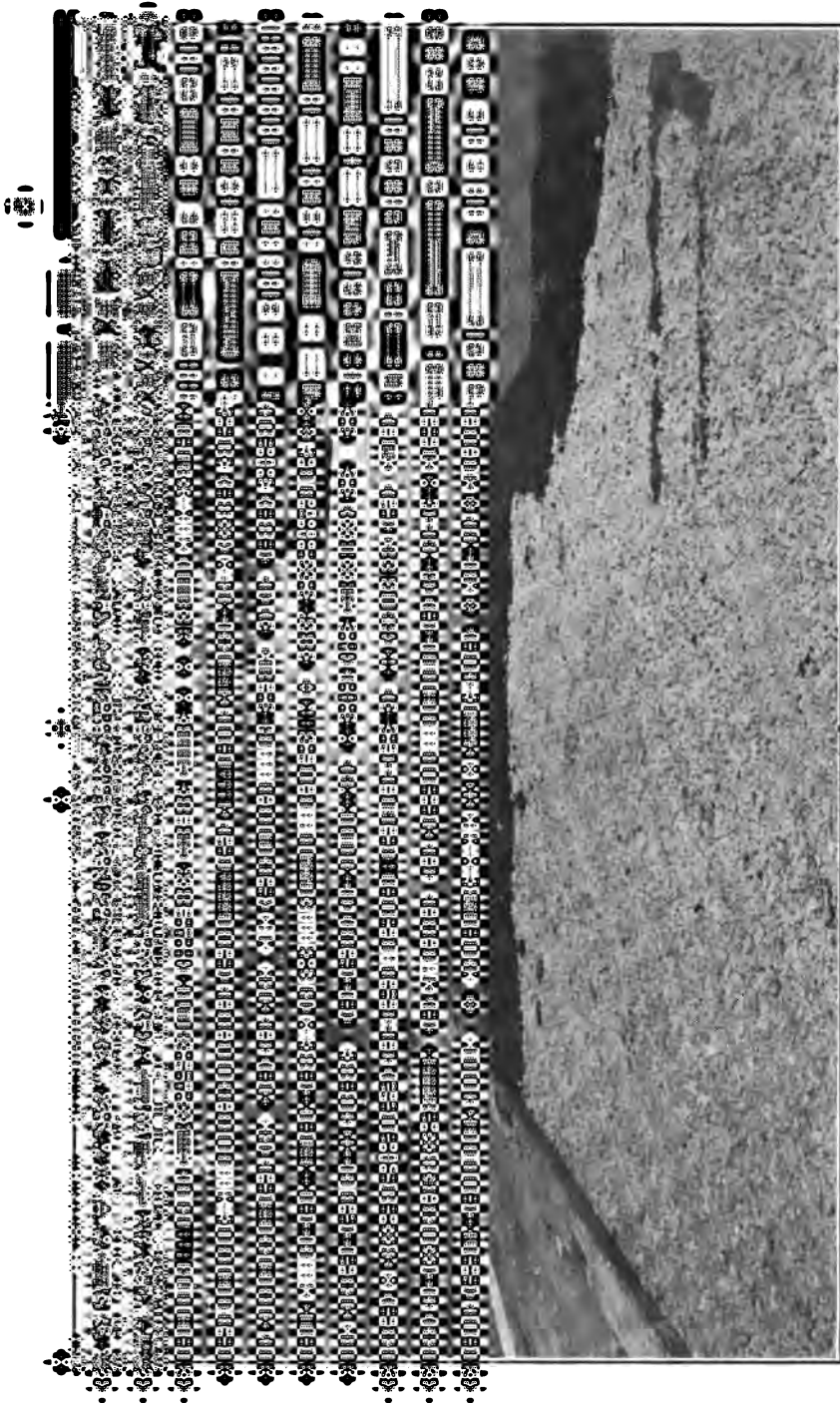
Typical Method of Handling Bituminous Material, Mixing Method, Before Spreading



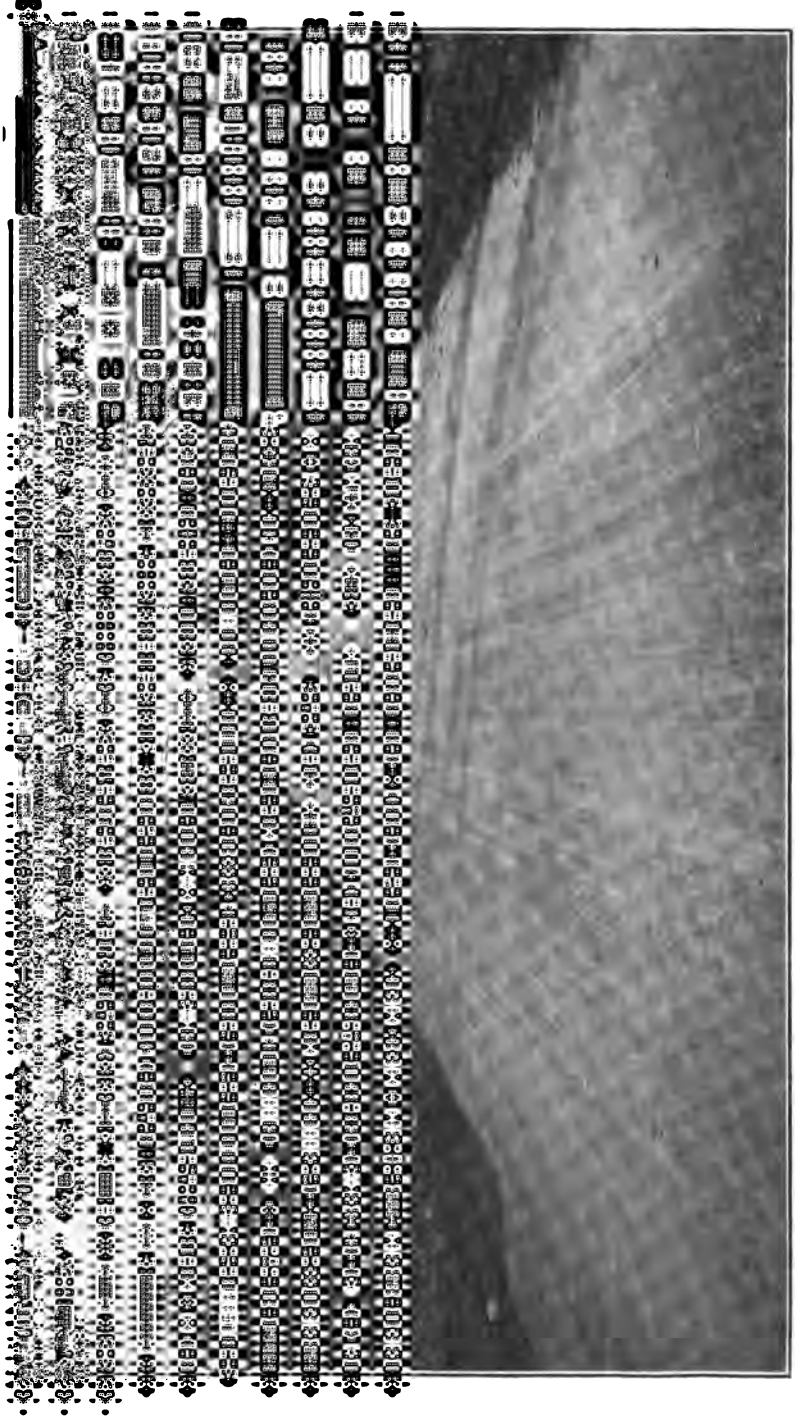
Typical View of Bituminous Material, Spread Before Rolling



Typical View of Bituminous Material Spread and Partially Rolled



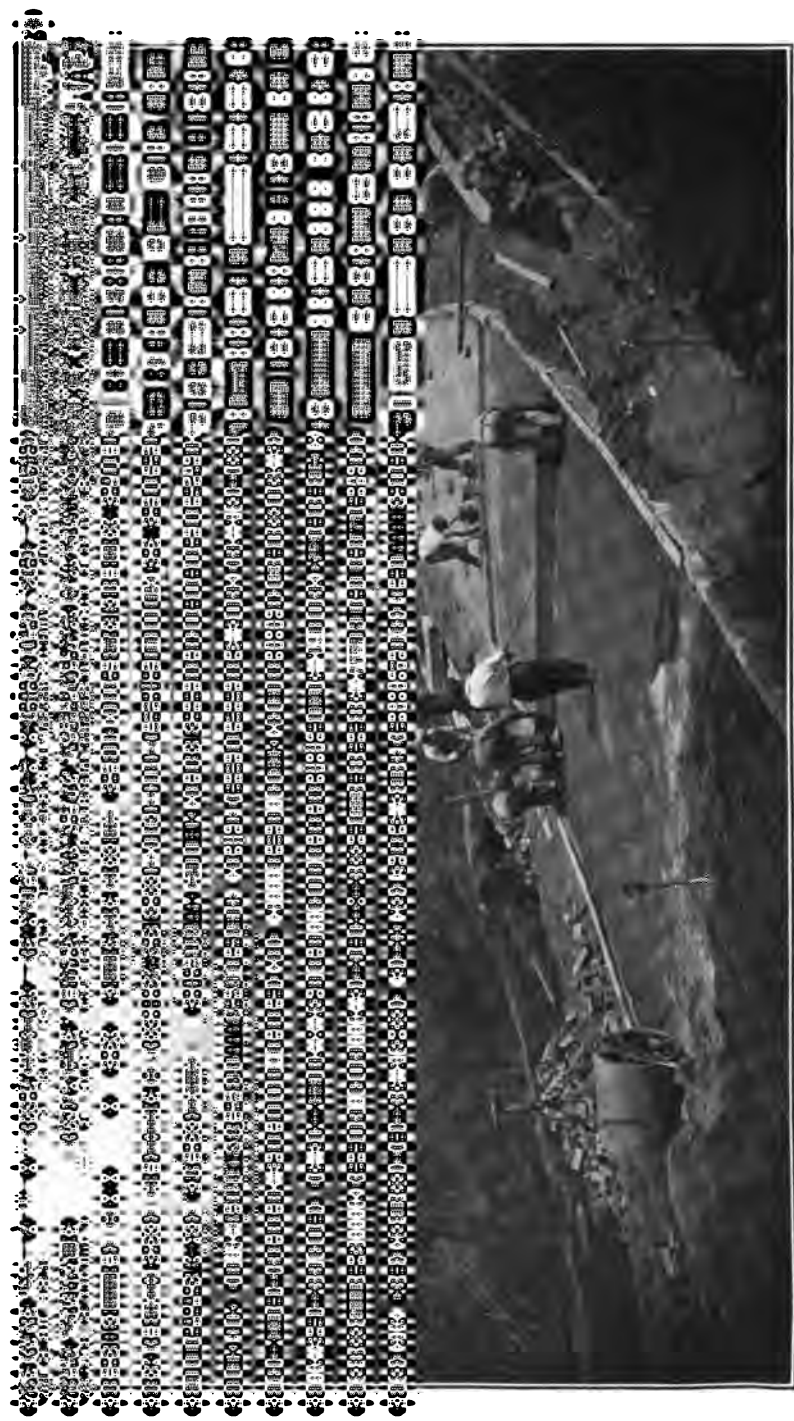
Typical View of Bituminous Pavement in Process of Rolling



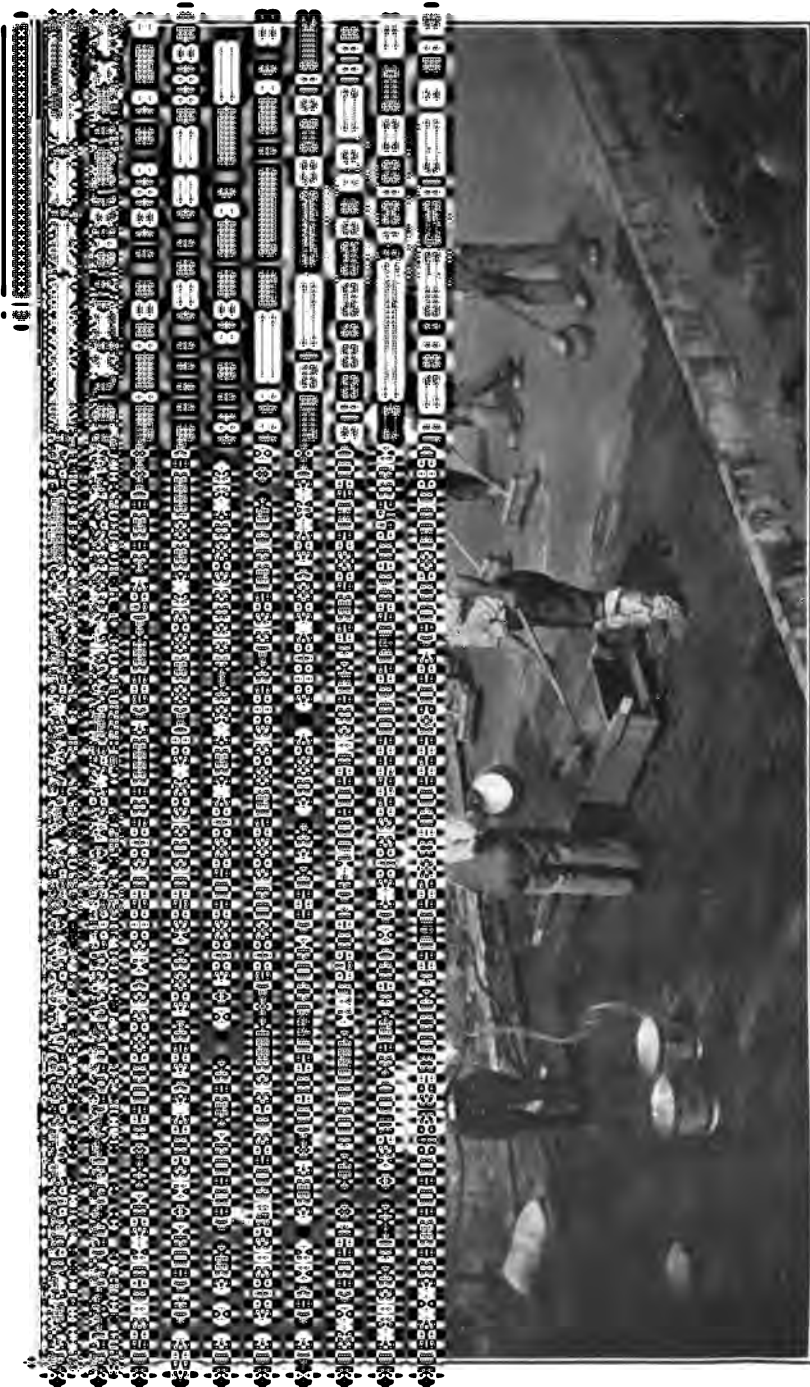
Typical View of Bituminous Pavement, Mixing Method Completed, Showing Offset for Cutting Out Section for Research Work



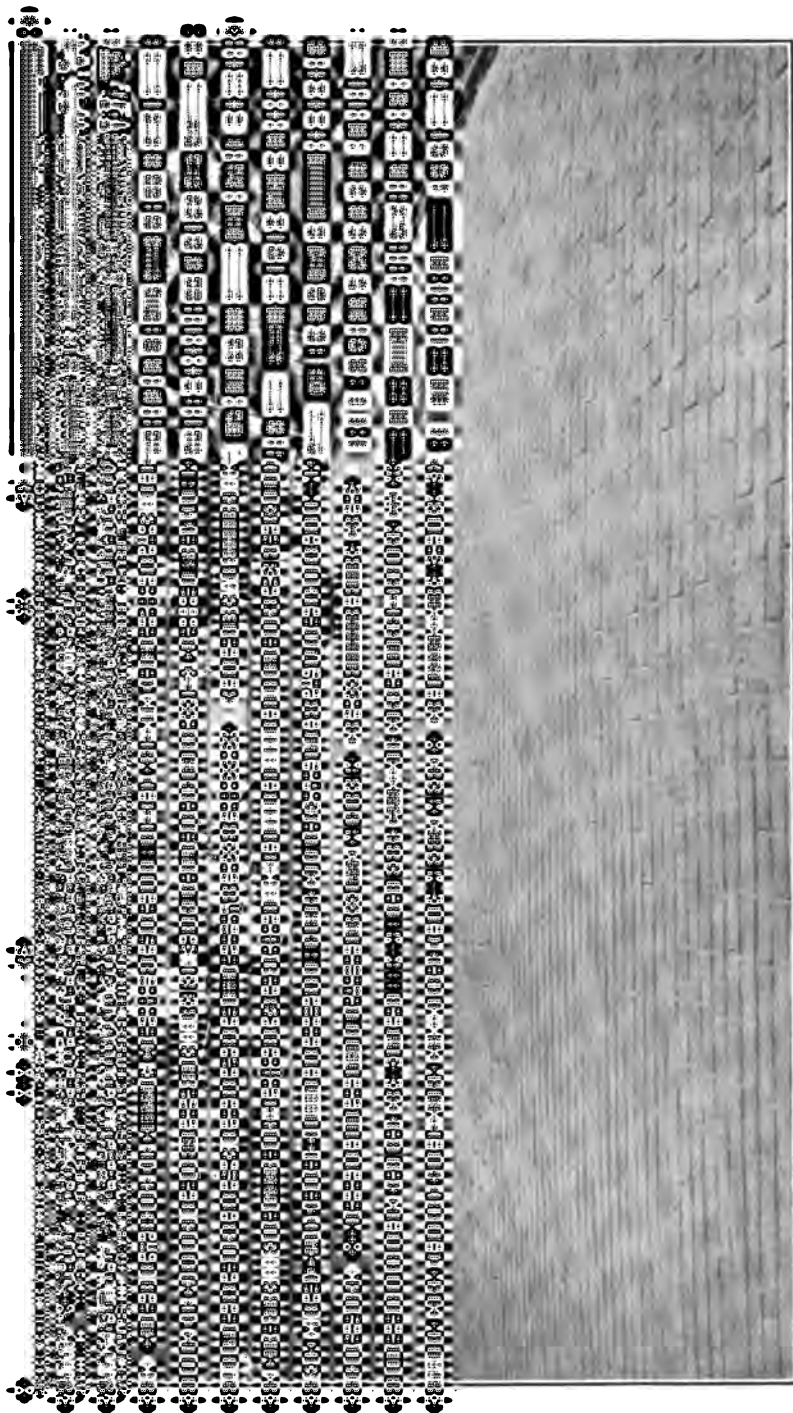
Typical View of Trimming and Shaping Shoulders



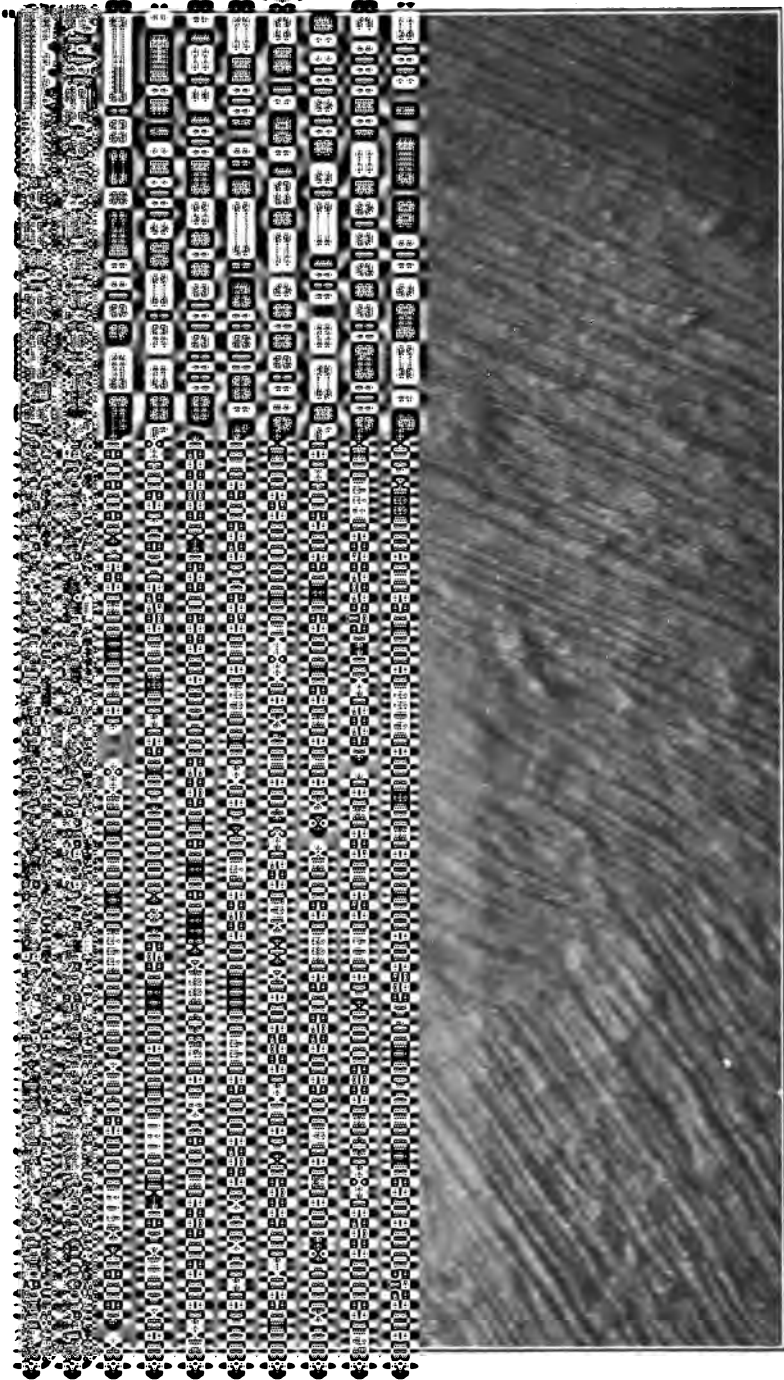
Typical View of Brick Pavement in Course of Construction, Showing the Laying of Brick and Striking of Sand Cushion



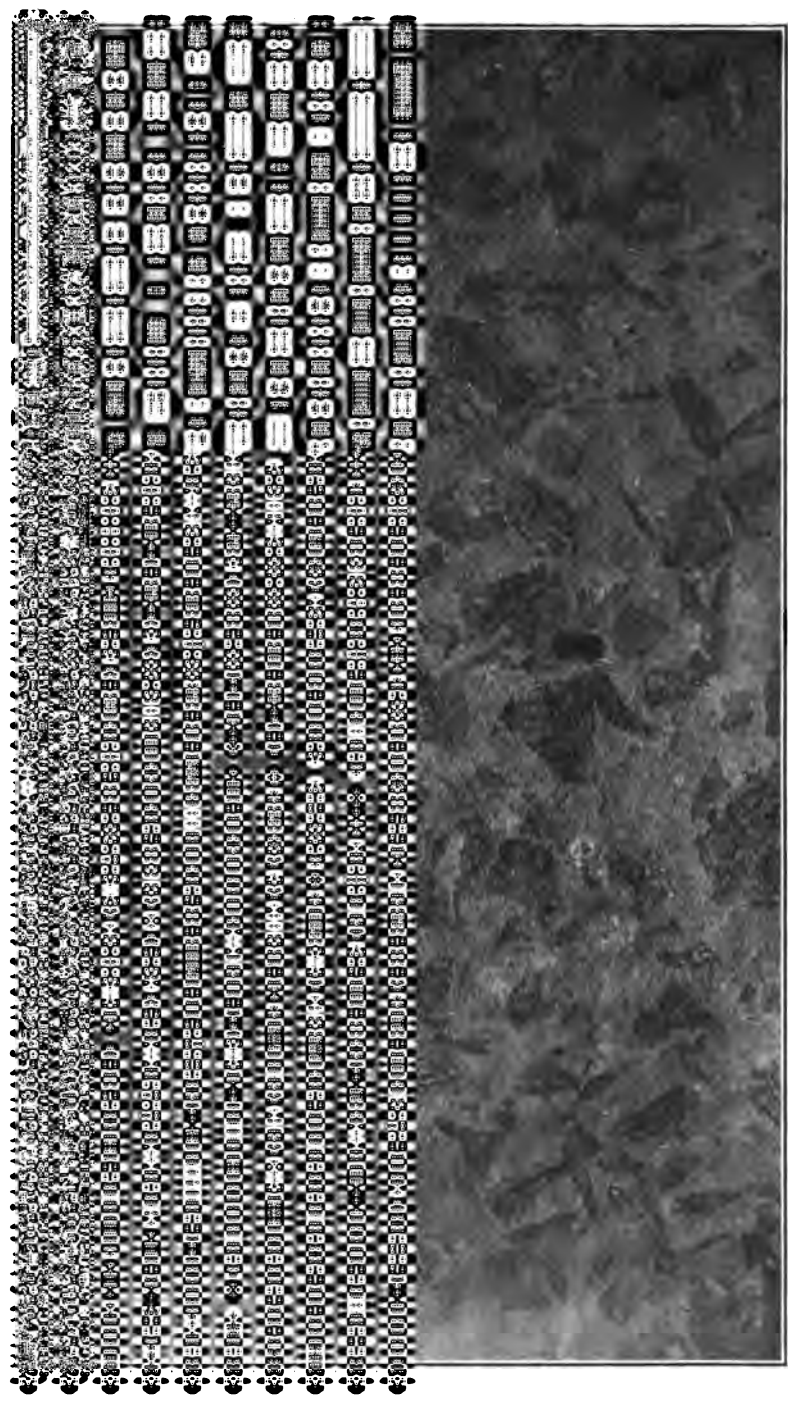
Typical View of Grouting Brick Pavements



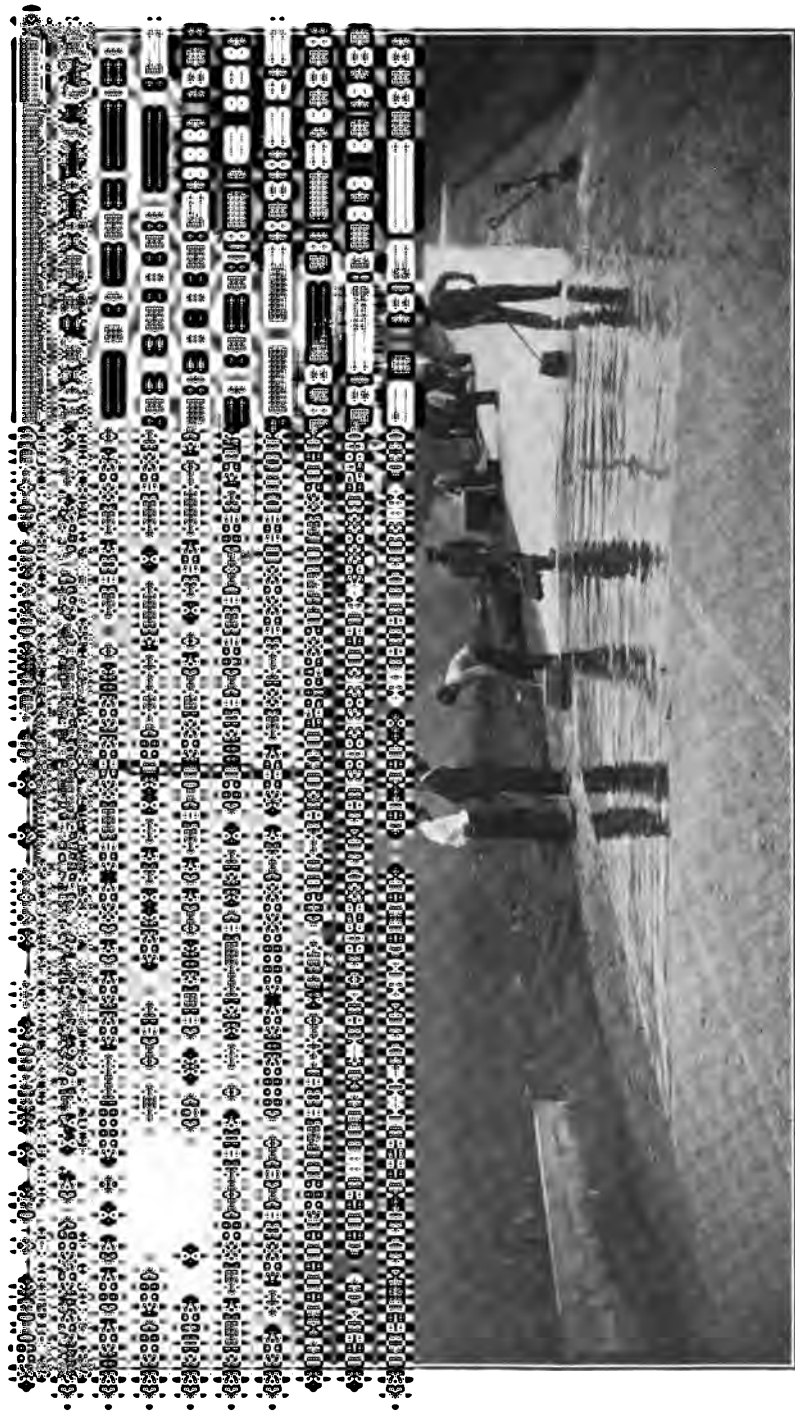
Typical View of Completed Brick Pavement, Showing Open Joints



Typical View of Surface of Concrete Pavement, **Method**, Before Applying Bituminous Material
Mixing



Typical View of Surface of Concrete Pavement, Mining Method, Before Applying Bituminous Material

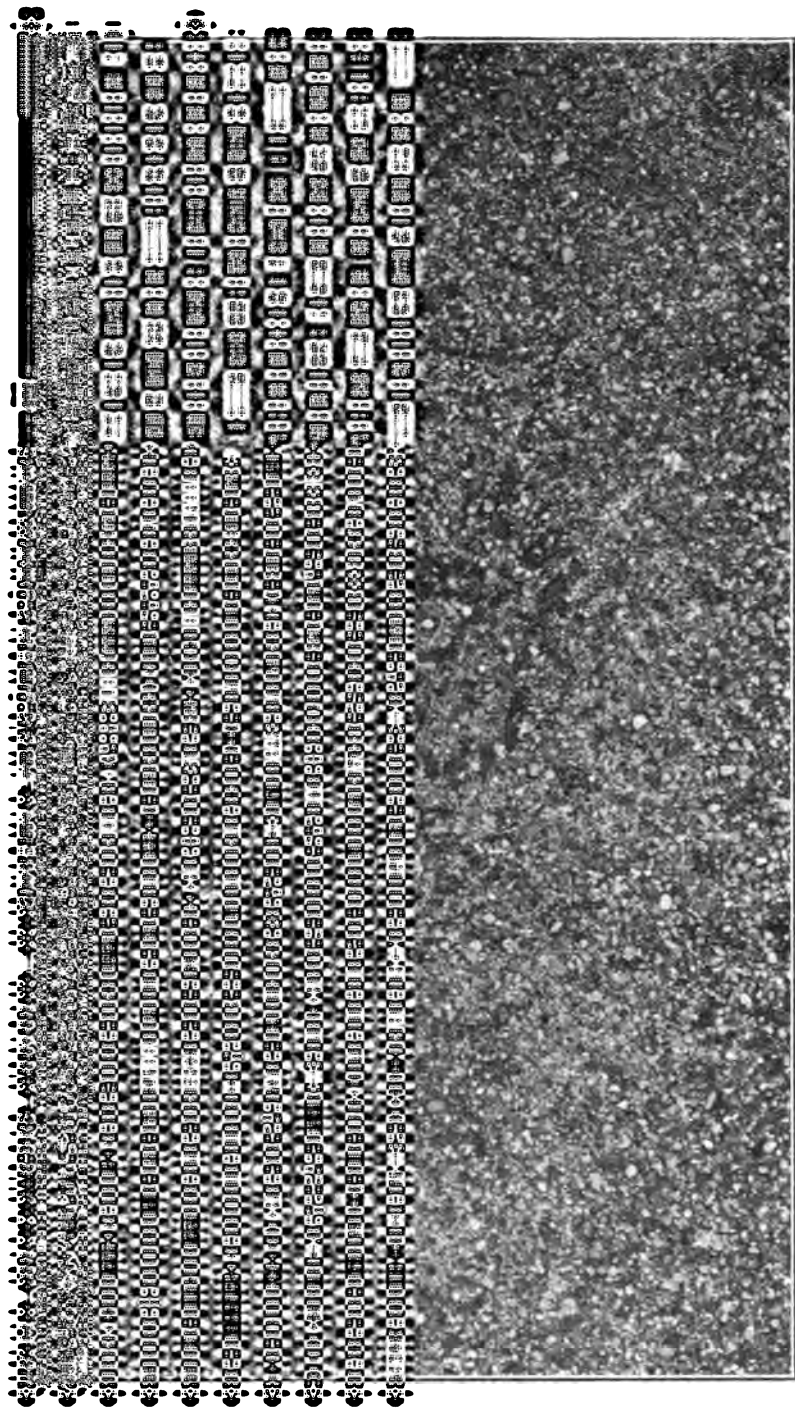


Typical View of Applying Bituminous Surface to Concrete Pavement

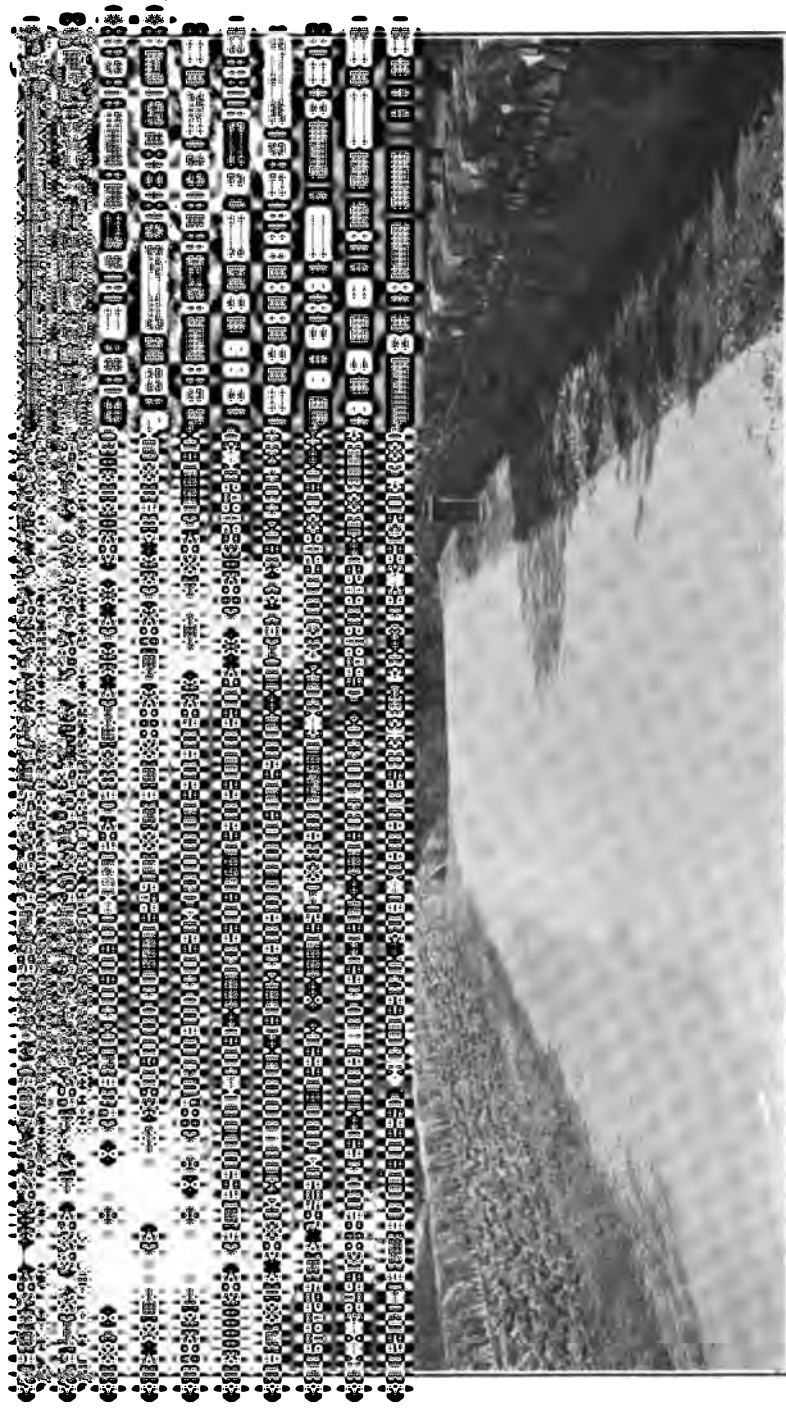


Typical View of Burning Bituminous Material for Bituminous Surface on Concrete

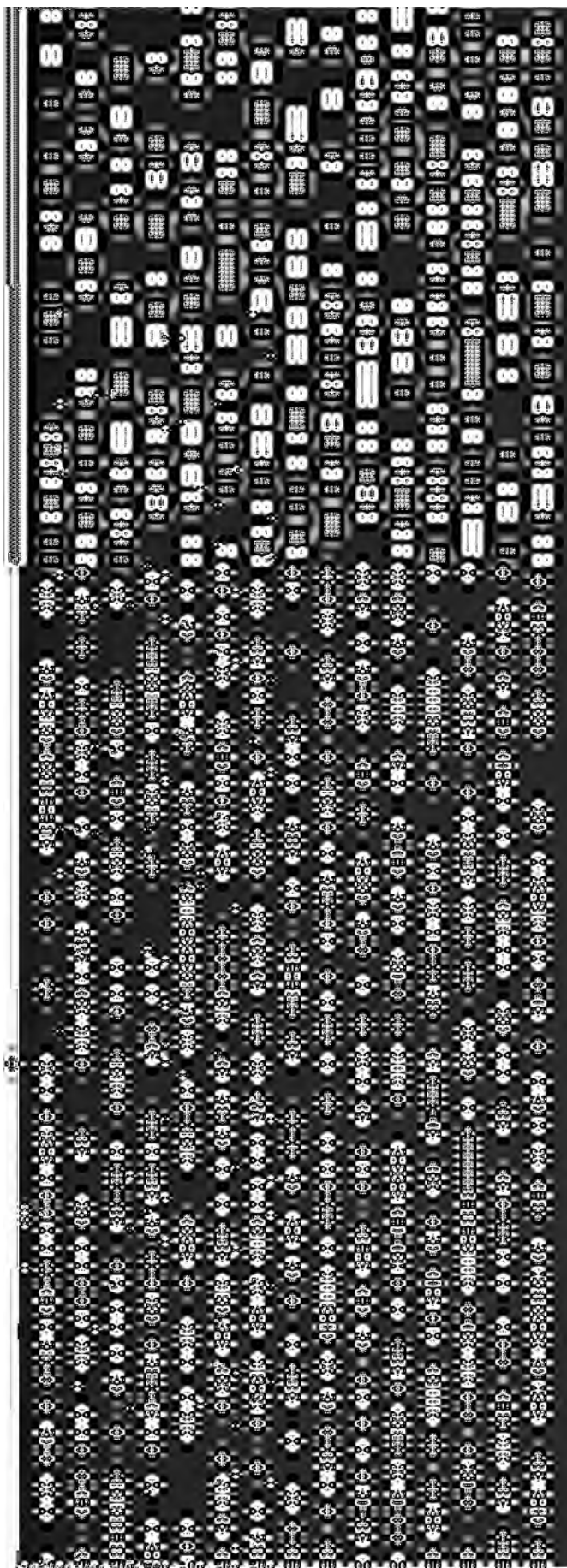


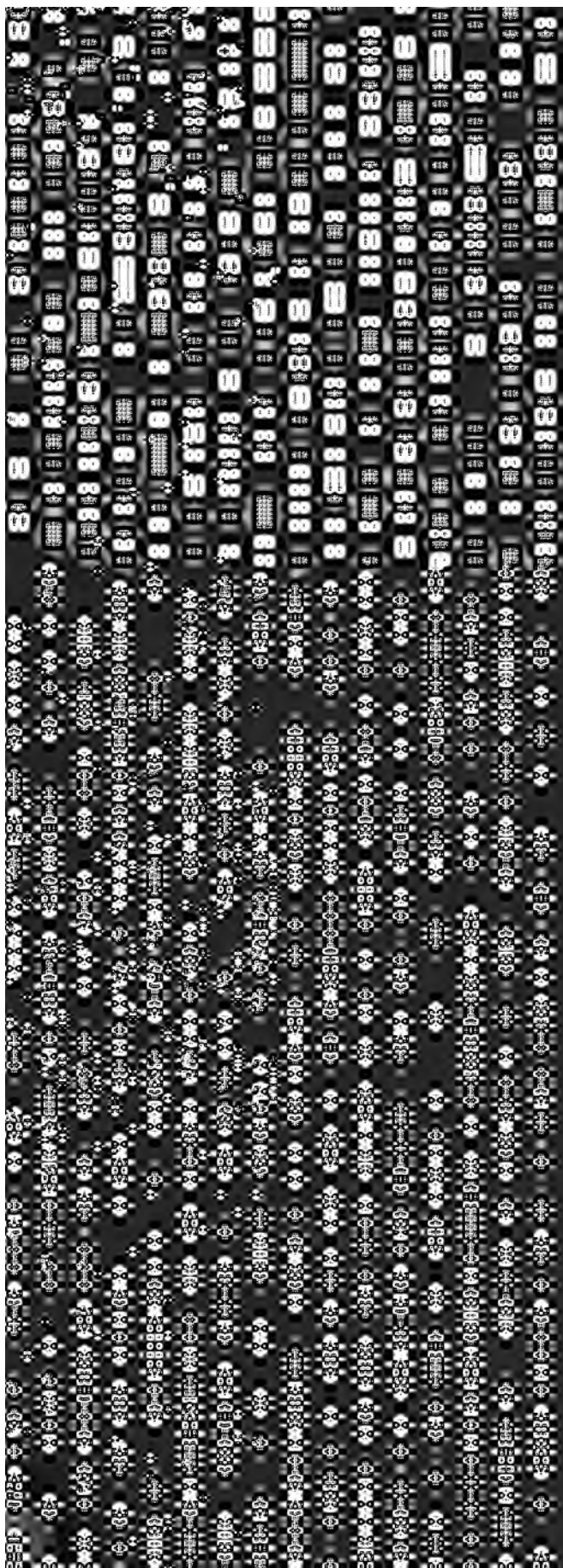


Typical View of Bituminous Top Applied to Concrete Pavement



Typical View Showing End of Service Test Road and Boundary Sign Between City of Philadelphia and Bucks County







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